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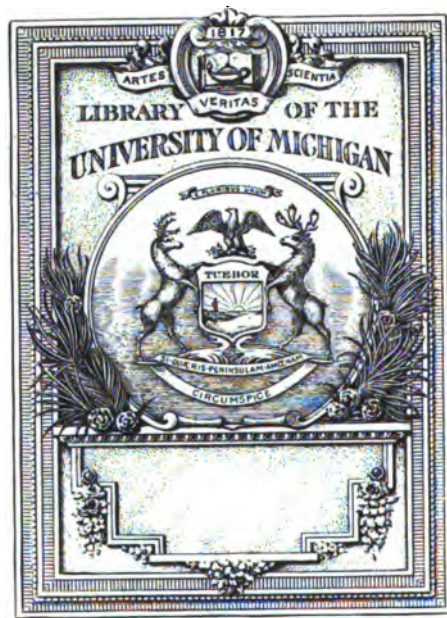
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THE  
GENERAL HISTORY  
OF  
INLAND NAVIGATION;

CONTAINING  
A COMPLETE ACCOUNT OF ALL THE CANALS

OF THE  
*UNITED KINGDOM,*

WITH THEIR VARIATIONS AND EXTENSIONS,

ACCORDING TO THE  
AMENDMENTS OF ACTS OF PARLIAMENT TO JUNE 1803.

AND  
A BRIEF HISTORY

OF  
THE CANALS OF FOREIGN COUNTRIES.

---

BY JOHN PHILLIPS, SEN<sup>R</sup>.

SOMETIME SURVEYOR TO THE CANALS IN RUSSIA UNDER  
MR. CAMERON, ARCHITECT TO THE LATE EMPRESS  
CATHERINE II.

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FOURTH EDITION.

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LONDON:

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1803.

TC  
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P56  
1803

*\*.\* This work having passed through three editions in quarto, the Author has been advised, for the purpose of a still more general circulation, to abridge it of such matter as was least useful; which has enabled him not only to reduce it to a moderate price, but also to add a large quantity of new and important information. He has also given the plan of a lock to save water, which will be found worthy of particular attention in such places as are liable to a deficiency.*

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## PREFACE.

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**N**OTWITHSTANDING the great success and approbation which my History of Inland Navigation, in one large volume quarto, has met with, yet the expense of such a work in such a form being necessarily great, I have thought that, as every person, whether engaged in agriculture or commerce, is more or less interested in the inland navigation of the country, an abridged edition, at a price within the reach of almost every reader, could not fail to be highly useful and acceptable.

In this edition, however, though much of the more unimportant part of my larger work has been omitted, yet many considerable additions and improvements have been made, and some errors have been corrected, and upon the whole I think it will be found as useful, and in some respects even superior to the original publication.

Notwithstanding the great and obvious advantages which have been reaped from inland navigation in every country where it has been practicable by nature, or rendered so by art, prejudices still exist against it in the minds of many well meaning, though not well informed, persons. To bring to the more

general knowledge of my countrymen the stupendous labours which have been undertaken and accomplished by other nations, and the advantages which have resulted from them, and to trace the rise, the progress, and the consequences of our own exertions in respect to inland navigation, are the principal purposes of this publication. Many schemes which have been proposed and afterwards abandoned will here be found recorded, and many hints are thrown out which may prove of service to future projectors.

My having been employed in England by the great Brindley, the father of English canals; having been a prisoner on parole for some years in America; and having travelled, with a particular view to observation on the state of their internal navigations, through Holland, Germany, and Poland, to Russia, where I was employed by the government, will be allowed perhaps to furnish reasonable pretensions to a proper knowledge of the subject.

No pains have been spared in the collection of materials; I have availed myself of every act that has passed the British Legislature on this subject, and also of every other publication within my knowledge that could furnish me with information of any importance. I do not, however, suppose but that I have committed some mistakes; but as this kind of improvement is yet only in its infancy, the necessary information is more difficult to collect, and errors are not so easily avoided; and I shall con-

**PREFACE.**

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sider myself greatly obliged to any gentleman for his friendly correction and information. I do not pretend to attain to elegance, but have endeavoured to be accurate and perspicuous ; to this praise alone I aspire, and with a modest and well founded confidence submit my performance to the judgment of an impartial but candid public.

**J. PHILLIPS.**

**LONDON, July, 1803.**



## INTRODUCTION.

---

**T**HE utility of inland navigation is now so generally acknowledged, and so satisfactorily proved by the beneficial effects already derived from it, that it seems scarcely necessary to say any thing on the subject. The canal begun by the Duke of Bridgewater in 1759, has so evidently shewn the great advantages to be derived from such works, and given birth to so many similar projects, that since that time no less than 165 acts of parliament have been passed for making and perfecting canals, or for improving the inland navigation of this country.

Inland navigation is highly beneficial to trade and commerce; by facilitating the communication between widely distant parts of the kingdom, reducing the price of carriage, and thus enabling the manufacturer to obtain his materials, fuel, and necessaries of life at a lower rate; to convey his goods to market at a less expense, and consequently to sell cheaper than his competitors. In countries which have the advantage of canals old manufactories are rendered more flourishing, and new ones established from day to day, in situations where, before, the land was but of little value, and but thinly inhabited. They render the countries through which they pass more rich and fertile; since every meadow and pasture displays a verdure never seen in the withered and

adust spots which are at a distance from the banks of rivers and running waters. The merchants who reside at the ports where they terminate must also derive very considerable advantages from them, as they are enabled to export greater quantities of goods from places at a distance from the sea, and to supply with ease a greater extent of inland country with the commodities they import from foreign nations.

There are, perhaps, few objects of internal policy that have so much called forth the powers and resources of the country as canals. They have not only been the means of enlarging our foreign commerce, but of giving birth to an internal trade, which, with all the advantages attendant on foreign commerce, has perhaps far exceeded it in extent, value, and importance. So great has been the effect which these canals, and the trade to which they have given birth, have had on our industry, population, and resources, that in many instances they have entirely changed the appearance of the counties through which they flow.

The reasons of this change are sufficiently obvious. As consumers, we are enabled by means of canals to import more cheaply; as producers, we export with greater facility. Do the materials of a manufacture lie dispersed? Canals unite them, and at the same time supply the persons employed in it with every necessary at the cheapest rate; and the land owner, whether we consider the surface of the soil, or the mines in its bowels, necessarily finds his advantage from new markets, and from having a cheaper carriage both for his productions and his manure.

The experiment has now been made for some years, and canals have been cut to an extent of above 1000 miles, and in most cases to the advantage of the public, even where they have not been profitable to the individuals concerned in them. In some parts of the country prejudices still prevail; and the popular objection, that inland navigation tends to diminish the number of our seamen, has frequently influenced the minds of those who were not biassed by any particular private interest. In some instances the coasting navigation may have been lessened by them, (though this has not been proved, and still remains doubtful) but in others it has been increased; and there can be no doubt that a greater extension of our distant navigation has arisen from a system which has, in effect, converted the internal parts of our island into coasts.

To the cheapness of conveyance, compared with land carriage, should be added the advantages attendant on an easy and secure communication of the different parts of the country one with another, during the tempestuous months, and in times of war; when vessels from the northern parts of Europe will readily make the Humber, whence, by means of canals, there is a communication with the rivers Mersey, Dee, Severn, Avon, Thames, &c. an extent of water carriage to the principal rivers, cities, and sea ports exceeding 500 miles, intersecting the whole interior part of the kingdom; and by which, merchandise may be imported and exported with perfect safety from boisterous weather or obtruding enemies. The greatest advantages may be also expected to result from safe and speedy communications between the east and west parts of this island,

by means of that grand undertaking the Forth and Clyde navigation. And if the proposed canals through the county of Hampshire should take place, goods and stores of all kinds from the magazines of London, Woolwich, &c. may then be certainly conveyed to Portsmouth; thereby avoiding a long circuitous, and hazardous navigation. Similar advantages will attach to many other places, which I shall not now enumerate, as they will strike the eye and convince the judgment of every one who inspects the map\*.

The bargemen and boatmen, though they have little experience in boisterous seas, are by no means unacquainted with the art of loading and unloading vessels, and frequently find their way into our sea-ports, and thence on board our ships. But however little inland navigation may be supposed to form navigators for the sea, no lives are lost on the calm element on which they are employed; the diseases of hot countries, so destructive to our seamen, are also unknown to them; and there is no danger of their desertion, either in peace or war, to the service of foreign states, our rivals and enemies. In short, if the abundance of fresh water rivers and lakes in a country have never been thought a detriment to its navigation, but the contrary, there seems no reason for supposing artificial inland navigations to be in this respect at all more injurious. When the history of inland navigation and the spirit of industry and commerce come to be better understood, and popular prejudices decline, these objections will be no longer urged.

\* See Bowles and Carver's Map of the Canals of England.

There are countries, in particular China and Holland; that have systematically encouraged canals and inland navigations at the public expense, neither of them wanting wealth, population, or employment. France has not been deficient in public undertakings of a similar nature. In England the zeal of individuals has had a public sanction; but the undertakings have been conducted at private expense. We build palaces for our public offices, and lavish immense sums in warlike preparations, more frequently actuated by caprice and passion, than guided by our true interests; but we do not sufficiently cultivate those projects which would tend to cherish industry, to produce wealth, and increase real national strength. A time may come when the general system of all governments may be directed more to the encouragement of such public undertakings as may promote population and the prosperity of the country, than to the despicable intrigues and destructive ambition of statesmen.

A highway, a bridge, or a canal may in most cases be made and maintained by a small toll upon carriages which make use of them; a harbour, by a moderate port-duty upon the tonnage of shipping which load and unload in it. When the carriages which pass over a highway or a bridge, and the lighters and barges which pass on a navigable canal pay toll in proportion to their weight or their tonnage, they pay for the maintaining those public works in proportion to the wear and tear which they occasion. A more equitable way of maintaining such works cannot be found; for the tax or toll, though advanced by the carrier, is finally paid by the consumer, to whom it is charged in the price of his

goods. Canals, roads, and bridges consequently must be made where there is trade to support them. In several parts of Europe, the toll or lock-duties of a canal is the property of some private person, whose interest obliges him to keep it in proper repair; if not, the navigation ceases, and with it his profit: his principal as well as his interest is therefore at stake. There is this difference between a high road and a canal, the road, if neglected, and suffered to fall to decay, is not entirely impassable, whereas a canal is. When a navigable canal has been once made, the management of it becomes quite simple and easy; and with respect to the making, it is reducible to strict rules and method; it may be contracted for at so much per mile and per lock: such undertakings, therefore, may be, and frequently are, very successfully managed by joint stock companies.

Good roads, canals, and navigable rivers, by diminishing the expense of carriage, put the remote parts of a country more upon a level with those in the neighbourhood of large towns; they are on that account the greatest of all improvements. They encourage the cultivation of remote parts, which must always be the most expensive circle of the country, and thereby rents are much improved. They are advantageous to towns by breaking up the monopoly of the country in their neighbourhood; and they are advantageous to all parts of the country; for, though they introduce some rival commodities, they open many new markets for produce.

It is not more than 70 years ago that some of the counties in the neighbourhood of London petitioned parliament against the extension of turnpike

roads into the remoter counties, because those remoter counties, it was pretended, from the cheapness of labour, would be able to sell hay and corn cheaper in the London markets than themselves, and would thereby reduce their rents, or ruin their cultivation. Their rents, however, have risen, and their cultivation has been improved since that time.

All canals may be considered as so many roads of a certain kind, on which one horse will draw as much as thirty horses on ordinary turnpike roads, or on which one man alone will transport as many goods as three men and eighteen horses usually do on common roads. The public would be great gainers were they to lay out upon the making every mile of a canal twenty times as much as they expend upon a mile of turnpike road; but a mile of canal is often made at a less expense than the mile of turnpike, consequently there is a great inducement to multiply the number of canals.

Bad roads, and a difficulty of communication between places remote from each other, occasion a kind of sterility in a country, and render most things much dearer and scarcer than they would otherwise be; and a nation placed in the most favourable climate, and blessed with the most fertile soil, if it have bad roads, and be without the convenient modes of conveyance, will not be so rich and affluent as one less favoured in climate and soil, which shall have excellent roads and canals, supposing the genius and industry of both nations to be the same.

When the Europeans first discovered America, the Peruvians, who were to a certain degree a civilize

nation, had no other methods of transporting goods and heavy materials but on porters' shoulders, or by the force of men's arms, and it has been supposed that 2,000 of them have been employed in removing one stone; a wide difference from modern times, when the improvements of mechanics in Europe will cause the same to be moved by five or six men, and with as little labour transported many miles on a canal. The cities, towns, and villages in Holland have such a communication with each other by water, that they appear like streets of the same city in respect to the convenience of carriage; and from every town of any size, at fixed times, passage-boats go from and to the neighbouring towns, conveying passengers and goods at cheap rates, and not less certain than our stage coaches. Till these advantages are adopted on our English canals, I shall not consider all the benefits to be received from them, which may be reasonably expected. The cheap and very pleasant conveyance by the Dutch Trackskuyts are mentioned with satisfaction by all travellers in that country; in general the canals of England pass through a country far more pleasant and more varied with hill and dale; the conveyance would be safe, and the voyage, if I may so term it, would, in the summer season, be enchanting, enjoying motion without fatigue, and all the pleasures of travelling at a very small expense.

Were we to make the supposition of two states, the one having all its cities, towns, and villages, upon navigable rivers and canals that have an easy communication with each other, the other possessing only the common conveyance of land-carriage and supposing at the same time both states to be



equal as to soil, climate, and industry, commodities and manufactures in the former state might be expected 30 per cent. cheaper than in the latter, or in other words, the first state would be a third richer and more affluent than the second. This perhaps is one of the chief causes of the great wealth of China, which historians tell us is wholly intersected with navigable rivers and canals: Great Britain and Ireland might soon rival China in this last particular, and consequently their people in general might be more rich and affluent.

There is yet one objection made to navigable canals, which I have not noticed, viz. that they waste or take up too great a portion of land in the countries through which they pass; but I hope it will be a full and cogent answer to this objection, that ONE MILE of a canal, 14 yards wide or broad, takes up little more than five acres of land. If these then are the great advantages attending inland navigation, and if the objections raised against it are so weak, let us hope that the prejudices of the uninformed will not prevent any of the great and noble projects which yet remain to be executed.

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ABRIDGED HISTORY  
OF  
INLAND NAVIGATION.

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SECTION I.

*Utility of Inland Navigation—Ancient Canals—Canals of Egypt—Account of the great Canal cut through the Isthmus of Suez, from Diodorus, Herodotus, and Strabo—Description of the Nilometer, or Instrument for measuring the Inundation of the River Nile.*

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THAT the greatest advantages are derived by mankind from navigation, which establishes an intercourse between all the different inhabitants of the earth, and enables them to supply their mutual wants, by exchanging their mutual productions, is a position which no one will dispute. To the improvements made in that most useful art are the commercial nations of Europe principally indebted for their superiority over the rest of the world in power and opulence, the consequence of their extensive trade, and the flourishing state of their manufactures.

But what the ocean is to the distant countries which it divides, navigable rivers and canals are to the different provinces and districts of the same



country; and as navigation on the former effects an intercourse and mutual exchange of productions between different kingdoms, in like manner inland navigation facilitates a communication between, and consequently promotes trade and industry in the different parts of the same kingdom. It seems, indeed, totally unnecessary at present, to attempt to enumerate the great benefits that accrue to trade and commerce from inland navigation. There is scarcely any civilized people, either ancient or modern, but have borne testimony to the utility of canals, by executing works of that kind.

Among the nations of antiquity, Greece, the mistress of the world in arts and science, did not want canals, that country being every where bounded and indented by the *Ægean* and *Ionian* seas, with their numerous bays, havens, creeks, and rivers; yet history informs us of many projects and undertakings of canals which were never completed.—*Demetrius*, *Poliorcetes*, *Julius Cæsar*, and the Emperors *Caligula* and *Nero* attempted, in vain, to cut through the *Isthmus*, by which *Peloponnesus* is joined to the rest of Greece, and thus form a communication between the *Ægean* and *Ionian* seas. We also find traces of canals cut to drain off the waters of the lake *Copais*, in *Boeotia*, of such remote antiquity, that all knowledge of the time when they were made have now been lost for many ages. The following is the account given of them by the ingenious and learned *Abbé Barthelemy*, in his travels of *Anacharsis*, the younger.

“ *Boeotia* may be considered as a large bason surrounded by mountains, the different chains of which are connected by high grounds. Other hills stretch

into the heart of the country; most of the rivers that proceed from them unite in Lake Copais, which is about forty-three English miles in circumference, and which neither has nor can have any apparent issue; it would, therefore, soon overflow Bœotia, had not the industry of man contrived secret passages to drain off the water. In the part adjoining to the sea the lake terminates in three bays, which advance to the foot of Mount Ptoüs, situated between the sea and the lake. From the bottom of each of these bays diverge a number of canals, that traverse the mountain its whole breadth, being more than three miles in length, and others a much greater extent. To excavate or cleanse them, very deep wells have been sunk, at stated distances, on the mountains.

“ The traveller, when he views these works, is astonished at the difficulty of the enterprise, as well as the expense it must have cost, and the time requisite for its completion. But what is still more surprising is, that these canals and pits, of which neither history nor tradition have preserved any remembrance, must be attributed to the most remote antiquity, and that in those distant ages we have no knowledge of any power in Bœotia capable of forming and executing so vast a project.”

Rome, more attentive to enslave the world by conquest, than to extend her commerce or improve the arts, affords us no examples of canals for internal navigation; but her magnificent aqueducts, though not strictly within the plan of the present work, deserve to be mentioned. These were constructed, at an immense expense, for the conveyance of water to that rich and populous city. Some of

them were of stone, others of brick, and others of wood; some conveyed the water under ground, and others above it, supported by arches of prodigious solidity, beauty, and grandeur; and of the latter, some are recorded to have extended one hundred miles in length. Frontinus, a man of consular dignity, who had the direction of the aqueducts, under the Emperor Nerva, tells of nine which emptied themselves through 13,594 pipes, of one inch diameter; and Vigenere observes, that Rome received from these aqueducts no less than 500,000 hogsheads of water every twenty-four hours.

In the year 1789 the canal which was cut by the Emperor Claudius to drain the lake Fucine into the river Liris, was begun to be cleansed, to the great relief of the neighbouring country, which was inundated by its obstruction.

Egypt, depending entirely on the overflowing of the river Nile for the watering of the country, contained a great number of canals, dug to receive and distribute the waters of that river at the time of the inundation; but the principal work of this kind, in that country, was the Grand Canal, by which a communication was made between the Nile and the Red Sea. This was begun, according to Herodotus, by Necos, the son of Psammeticus, who desisted from the attempt on an answer from the oracle, after having lost 120,000 men in the attempt. Diodorus Siculus gives the following account of this canal.

“ A canal of communication has been cut, which passes from the Gulph of Pelusium into the Red Sea. It was begun by Necos, son of Psammeticus, and continued by Darius, king of Persia; but at length laid aside by the advice of some persons, who asserted

that it would lay Egypt under water, because the land was below the level of the Red Sea. Ptolemy II, however, finished the undertaking; but constructed in the most convenient part of the canal a dam or sluice, ingeniously contrived, which opened to give passage, and immediately closed again; on that account the river which discharges itself into the sea, near the city of Arsinoe, has received the name of Ptolemy's River."

*This canal was wide\* enough for two galleys to pass abreast, and four days sailing in length; and was far superior, for utility, dimensions, and trade, to any other canal in the then known world. The wealth of India, Persia, Arabia, and the kingdoms on the coast of Africa, were brought by shipping to the Red Sea, and by this vast canal conveyed to the Nile, whence it was distributed by the Mediterranean not only to Greece and Rome, but to all the surrounding nations, until the Portuguese discovered a way to India by the Cape of Good Hope.*

*This canal, after the time of Ptolemy, fell into disuse, and policy had probably some share in the neglect of it; but it was again opened in the year 635, under the Caliph Omar. Elmacin, indeed, says that a new canal was then made for the conveyance of the corn of Egypt to Arabia; but this is more naturally to be understood of the renewal of the ancient one, the navigation of which, towards the decline of the Roman empire, had been much neglected. The same author adds, that it was stopped again, at the end next the Red Sea, by the Caliph Abugia, or Almanzor, the second of the family of Abbas, in the year of the hegira 150, answering to*

\* One hundred cubits, of 22 inches to a cubit.

the year of Christ 775. There are some ~~traces~~ of it still subsisting. M. Boutier, in 1707, discovered the end which rises out of the most easterly branch of the Nile.

Abulfeda thus describes the beauty of the canal of Faoua :—" No prospect can be more enchanting or agreeable ; gardens, groves, and eternal verdure adorn its banks, which are shaded by date trees, covered with vines, and embellished with pleasure houses." The above canal was cut from the Nile to Alexandria, by Ptolemy, to fill the immense cisterns which are vaulted with great art, and constructed in all parts of that city. The numerous magnificent aqueducts are still almost entire, although they are above 2000 years old ; most of them are now useless, and have been so for many ages.

Strabo tells us that the canal between Alexandria and Canopus, in which was a temple of Serapis, was loaded night and day with boats, which carried religious votaries to the deity ; this canal is now dry. Herodotus also says, that the stones for the building of the temple of Latona, in Egypt, were brought by rafts down the canals of the river Nile, a distance of 200 leagues. He measured one single stone, which was 60 feet long, and six feet thick, and which was intended for a pedestal for a column fifty feet high, six feet diameter, and also cut out of one single block of stone.

The annual inundations of the Nile are the source of the fertility of Egypt. When the waters have risen to a certain height, the Khalig, or grand canal, is opened, by which they are conveyed by a prodigious number of small canals into reservoirs and cisterns, to be distributed among the fields and gardens as

wanted. To discover when they have attained this height, a pillar, called a Nilometer, is erected in an island opposite Grand Cairo, and divided into picts, a measure of about two feet. The following is an account of it, as given by Baron Tott.

“ The progress of the inundation is observed at the Nilometer, situated at the southern point of the island of Rhoda, opposite Old Cairo ; public criers, distributed in every quarter of the capital, every day make known to the people the rising of the waters, till they are come to the height proper for opening the canal by which they are conveyed to the middle of the city and the cisterns. But this moment cannot be obtained with precision, because superstition prevents the eye of curiosity from approaching the graduated column placed in the centre of the bason of the Nilometer. The cry of *oof-allah*, which signifies God has kept his promise, proclaims the opening of this canal. Children bearing streamers of different colours accompany the crier, and diffuse a general joy at the certainty of plenty.

“ Sultan Selim, after having conquered Egypt, gave it laws, established a new form of government, and decreed that this kingdom, now become a province of his vast empire, should be liable to a tribute only when the increase of the Nile should be sufficient for opening the canal ; as, in fact, it is, then only that the waters are sufficient for the service of agriculture. This takes place every year. But it is not merely this degree of increase that yields the greatest plenty ; to produce that, the waters must reach to the foot of the mountains ; and then it is that the criers proclaim *minel-dgebell-il-dgebell*, “ From one mountain to another.”

“ The ancient Egyptians had the barbarous custom of sacrificing a young girl to the Nile, when the waters rose to a sufficient height for opening this canal. They call her the *ardossa*, or the bride ; and the name and ceremonies of this sanguinary festival are still preserved, though the Caliph Omar has rendered it more consistent with humanity, by substituting a pillar of earth and clay, which is made to represent the victim, and is thrown into the Nile. The principal inhabitants of Cairo appear at this ceremony in their gondolas, richly ornamented ; and it is always succeeded by entertainments and fireworks. A great number of other canals, taken care of by those only who derive advantage from them, issue from that arm of the Nile which runs to Damietta, and fertilize the province of Sharkia, which, making part of the Isthmus of Suez, is the most considerable of Egypt, and the most capable of a great increase of cultivation. The plains of Gaza, which lie beyond, and are possessed by the Arabs, would not be less fertile, if the spirit of devastation did not destroy even the spontaneous productions. A number of other canals run through the island of Delta, many of which are navigable ; and that of Manoof, or Meneuf, communicates with the two branches of the Nile, ten leagues below the angular point called *the belly of the cow*. This canal begins at Nadir, and not at Gueseid, where D’Anville has placed its mouth, and crosses the province of Manusia, the cultivation of which may be compared to a well managed kitchen garden.

“ The vestiges of the canals which watered the provinces westward and eastward of the Delta prove them to have been the best cultivated of any part of

ancient Egypt; we may also presume, from the extent of the ruins of Alexandria, the construction of the canal, and the natural level of the lands which encompass the lake Mareotis, and extend themselves westward to the kingdom of Barca, that this country, at present given up to the Arabs, and almost a desert, was once sufficiently rich in productions of every kind to furnish the city of Alexandria with *its* whole subsistence."

The valuable discoveries within these few years, by proper persons employed by the commanders of the French and English armies, will greatly enrich the discoveries heretofore made public, as soon as they can be properly arranged and published.



## SECTION II.

*A Description of the Canals of China and Hindoostan, and the prodigious Trade carried on by them from the remotest Part of the Empire. Selected from the best approved Authorities.*

## CHINA.

IN the great empire of China there is scarcely a town, or even a village, which has not the advantage either of an arm of the sea, a navigable river, or a canal; by which means navigation is rendered so common, that almost as many people live on the water as on land.

The Great Canal, which is also called the royal canal, is one of the wonders of art; it was finished about the year 980; and 30,000 men of all denominations were employed forty-three years in completing it. It runs from north to south, extending from the city of Canton to the extremity of the empire; and by it all kinds of foreign merchandise, entered at that city, are conveyed directly to Pekin, being a distance of 825 miles. Its breadth is about fifty feet, and its depth a fathom and a half, which is sufficient to carry barks of considerable burthen, which are managed by masts and sails, as well as by oars; and some of a smaller sort are towed by hand. The Emperor of China is said to employ 10,000 ships, abating one, (for a reason very peculiar). This canal passes through, or near, forty-one large cities;

cities; it has seventy-five large sluices to keep up the water, and pass the barks and ships where the ground will not admit of sufficient depth of channel; besides several thousands of draw and other bridges. Innumerable canals are cut from this main canal; and the whole empire abounds with rivers, lakes, and rivulets.

China owes the greatest part of its riches and fertility to these numerous canals, which are of the greatest utility for the transportation of the produce and merchandise of one province to another. They are bordered or faced with quays of freestone; and in low marshy places very long causeways are raised for the convenience of travellers. These canals are cut through any kind of private property, gardens, plantations, or pleasure grounds; not even the gardens of the Emperor, or any of his mandarins, or governors, are exempted; but when the work arrives at the garden or pleasure ground, the governor, or even the Emperor himself, digs the first spade of earth, and pronounces with an audible voice, "This is to let those of inferior situations know that no private pleasure shall obstruct the public good." There are bridges over these canals of three, five, seven, or more arches, to open a free communication with the country; the middle arch is, in general, very high, that barks and barges may pass under it with their masts standing. When the water is high and liable to overflow the neighbouring fields, they take care to open the sluices, to convey it away, and to keep it at a certain height in the canal. There are inspectors appointed to survey the canal, and visit it continually, and workmen always ready to repair any damaged places,

And here I must mention one circumstance in which it would not be beneath the magistrates of this country to imitate the example of the Chinese. In the whole of this great empire of China it is an established maxim, that when a crime of magnitude is committed, the mandarin of the province shall be punished, because the law commands him to take care of the morals of the people. As God has given to every country the means of subsistence, it is a high offence to magistracy that men should commit crimes through distress. The criminals are obliged to work on the canals for a time, according to their several offences; they wear a disgraceful dress, and are allowed only a bare support of ordinary provisions.

F. Magaillane assures us, that there is a passage by inland navigation from one end of the empire of China to the other, being a space of 600 French leagues, and that a traveller may go this whole distance entirely by canals and rivers, except one single day's journey by land, to cross a mountain; an advantage which this Jesuit, who made the voyage himself, observes, is not to be found in any other kingdom or state in the known universe.

The Abbé Grosier observes, that it is recorded in the annals of China, that their emperors gave every encouragement to agriculture, and thought it far superior to gold, silver, or precious stones. One particular, says he, deserves notice. About the year 1500 a merchant had opened a mine of precious stones (diamonds). As soon as it was known to the Emperor, he caused it to be shut up, with this observation—"Useless labour causes sterility, a mine of precious stones does not produce corn."

For several of the preceeding observations on China I am obliged to Father Du Halde. The following are extracted from the journey of Louis le Comte, the Jesuit, who was above ten years a missionary, and travelled through the whole empire of China.

“ Although China were not of itself (says he) so fruitful a country as I have represented it, the *canals* which are cut through it would be alone sufficient to make it so ; but besides their great usefulness in watering the country, and promoting trade, they also add greatly to its beauty. They generally contain a clear, deep, and running water, which glides so softly that it can be scarcely perceived. There is commonly one in every province, which answers the purpose of a road, and runs between two banks, built up with flat coarse marble stones, bound together by others which are jointed into them.

“ One large canal generally runs through every province, and a vast number of smaller ones are cut from the large one, which again are divided into some still smaller, or rather rivulets, which end at some village or great town ; sometimes they discharge themselves into a lake or large pond, from which all the adjacent country is watered, so that these clear and plentiful streams, embellished by a great number of fine bridges, bounded by neat and convenient banks, equally distributed through vast plains, covered with a multitude of boats and barges, and crowned (if I may use the expression) with a prodigious number of towns and cities, whose ditches they fill, and whose streets they form, at once ren-

render that country the most fruitful and most beautiful in the world.

“ Surprised, and as it were astonished, at so noble a sight, I have sometimes borne a secret envy to China in behalf of Europe, which certainly can boast of nothing in that kind to be compared to the works of the Chinese. What would it be then, if that art, which in the wildest and most unlikely places has raised magnificent palaces, gardens, and groves, had been employed in that rich land to which nature has been so lavish of her most precious gifts ?

“ The Chinese say their country formerly was totally overflowed, and that by dint of labour they drained the water, by cutting it a passage through these useful canals. If this be true, I cannot enough admire, at once, the boldness and industry of their workmen, who have thus made great artificial rivers, and from a kind of sea created the most fertile plains in the world.

“ It will scarcely be believed that men so ignorant in the principles of physics, and the art of levelling, could bring such works as these to perfection ; yet it is certain that these canals were dug by men, for they are usually straight, and their distribution is equal and orderly. There are floodgates made for the rivers to let in their water, and others to let it out when too full ; so that it cannot be doubted but that the Chinese are indebted to their own industry only for their great conveniences.

“ Among all those canals in the southern provinces is one above the rest called the Great Canal, because it traverses the whole country from Canton, which lies on the southern side, to Peking, which is situated

in the northern part of the empire. We need only travel a short day's journey to cross the mountain, called Moilin, which on one side bounds the province of Kiamsi. Two rivers rise in this mountain, one of which runs southward to the sea, and the other northward as far as the river of Nankin, whence, by the Yellow River, and several canals, we may proceed by water to the very mountains of Tartary.

"But since, in this vast extent of ground, of above 400 leagues in length, the earth is not level, or hath not a descent proportionable to the emanation of the waters, it was necessary to construct a great number of sluices. They are called by the name of sluices in the relations of travellers, notwithstanding they are very different from ours; they are rather water-falls, and, as it were, torrents, which are precipitated from one canal into another, and more or less rapid, according to the difference of their level. To cause barks or barges to ascend, they make use of a great company of men, who are maintained for that purpose near the sluice; after they have drawn cables and ropes to the right and left, to lay hold of the barge in such a manner that it cannot escape them, and every cable and rope is made tight, they have several capsterns, by help of which they raise it by little and little, by exerting the utmost strength of their arms, and employing levers till they have raised it into the upper canal, in which it continues its voyage. This labour is tedious, toilsome, and exceedingly dangerous. They would be wonderfully surprised could they behold with what ease and facility one man alone, who opens and shuts the gates of our locks and sluices in Europe,

makes the longest and heaviest laden barges and barks securely to ascend and descend.

“ I have observed in some places in China, where the waters of two canals have no communication, yet they make the boats pass from one into the other, notwithstanding the level may be different fifteen feet : to effect which they proceed in the following manner. At the end of the canal they have built a double glacis, or sloping bank of freestone, or rather two inclining planes, which, uniting at the point, extends itself on both sides up to the surface of the water. When the bark is in the lower canal they hoist it up, by the help of capsterns, to the plane of the first glacis, so far, till being raised to the point, it falls back again, (falls forward, I suppose) by its own weight, along the second glacis, into the water of the upper canal, where it skuds away at a considerable distance, like an arrow out of a bow ; and they make it descend in the same manner proportionably. I cannot imagine how these barks, being commonly very long and heavy laden, escape being split in the middle, or their backs broken, when they are poised in the air upon this acute angle ; for, considering the length, the lever must have a strange effect upon it : yet we do not hear of any accidents happening in consequence of it. I have passed that way several times, and all the precaution they take, when they do not chuse to go on shore during the operation, is to tie themselves fast to some cable or rope, for fear of being tossed from stem to stern, or from poop to prow.

“ We meet with no such sluices in the grand canal, because the Emperor's barks, that are as large as our frigates, could not be raised sufficiently by

force, without being infallibly split or back broken in the fall. All the difficulty consists in surmounting these torrents, of which I have spoken : yet this is what they perform successfully, though not without some trouble and expence.

“ These water passages, as they call them, are necessary for the transportation of grain and stuffs, which they fetch from the southern provinces, and carry to *Pekin*, their capital. There are, if we may give credit to the Chinese, 999 barks, from 80 to 100 tons each, that make a voyage once a year, all of them freighted for the Emperor, without mentioning those of particular persons, which are innumerable. When these prodigious fleets set out, one would imagine that they carried the tribute of all the kingdoms of the East, and that one of these voyages alone was capable of supplying all Tartary with a sufficiency for its subsistence for a number of years. But *Pekin* alone receives the benefit of it, and this would be scarcely any, did not the provinces beside contribute to the maintenance of this vast city, the circumference of which is six great leagues, allowing 3600 paces to a league, and contains, at least, 2,000,000 of people ; and it has been judged to contain not less than 6,000,000 of souls, and that the above 2,000,000 are only men, without reckoning women and children. But the exact number is very difficult, if at all, to be ascertained.

“ The Chinese not only make canals for the convenience of travellers, but they also dig many others to catch the rain water, which comes down from the mountains, and with which they water the fields in time of drought, more especially in the northern provinces. During the whole summer you may see



the country people busied in raising this water into abundance of small ditches or channels, which they cut across the fields. In other places they contrive large reservoirs of turf, the bottom of which is raised above the level of the ground about it, to serve them in cases of necessity; besides, they have every where in the provinces of Xensi and Xansi, for want of rain, certain pits from twenty to one hundred feet deep, from which they draw water with incredible labour. If, by chance, they meet with a spring of water, it is worth observing how carefully they husband it; they sustain it by banks in the highest places; they turn it here and there, a hundred different ways, that all the country may reap the benefit of it; they divide it by drawing it by degrees, according as every one has occasion for it; insomuch that a small rivulet, well managed, sometimes dispenses fertility to a whole province."

That which most charms the eye is the immense number of large boats with imperial colours, and beautifully painted; that sail in fleets, and commanded by a single manderin of the province, and loaded with its best productions, and chiefly on the Emperor's account. There are several classes or rates of these boats, very neat and commodious; a middle sized one has a hall and four very convenient rooms, besides a good kitchen and place for the attendants; the rooms are generally neatly carved, painted, and gilt; even the ceiling is painted, and the whole varnished; some of these boats are of 200 tons burthen, and from 300 to 400 of them on the same canal at the same time, and sometimes in one fleet; and by the clearness and well governing of the canals, it is rendered the most pleasant and fertile country

in the world. Their cities are immensely large and populous, and when you have passed through one city one could scarcely expect to find another so large and populous; but before being well out of sight of the one you are in view of another as large, or perhaps larger; and both Du Haldé and Le Comte, and F. Magallanc and Abbe Grosier aver that there are 2357 cities and fortified towns in the fifteen provinces of China, and 59 millions of men. A late traveller says there is 120 millions of inhabitants.

The Chinese junks are strong roomy vessels, from 100 to 200, and some 300 tons burthen; the hold below deck is divided into several distinct apartments, partitioned off with two inch plank, grooved or rabbeted as close as possible, and the joints or seams are caulked with a cement of lime, pitch, &c. prepared in such a manner as to render it perfectly water tight. A junk may strike against a rock and not sink; a leak may be sprung, but will damage no further than the goods in that apartment.

To the above accounts of the canals of China, I shall now add some description of those in other parts of Asia, which I doubt not, will be highly acceptable to the curious enquirer on this subject, as it tends to shew the skill and intelligence of the natives of that quarter of the globe, their ideas of the advantages of inland navigation, and with what industry they have laboured to promote commerce by its means. The following account of the canals and inland navigation of Hindoostan, or the Mogul Empire, more commonly known by the name of Bengal, is extracted from Mr. Rennel's Memoirs of Hindoostan, published in 1788.

“ The countries between Delhi and the river Panzah, being scantily supplied with water, the Emperor Feroze III. undertook the noble, as well as useful task, of supplying it better, and at the same time meant to apply the water, so furnished, to the purposes of navigation. Dowl (vol. i. p. 327) translates Ferishta thus :—

‘ In the year 1355, Feroze marched to Debalpour, where he made a canal 100 miles in length, from the river Suttuluz to the river Iidger. In the following year, between the hills Mendouli and Sirmore, he cut a canal from the river Jumma, which he divided into seven streams, one of which he brought to Hassi, and from thence to Beraisen, where he built a strong castle, calling it by his own name. He drew, soon after, a canal from the river Caggar, passing by the walls of Sirsutti, and joined it to the river of Kera, upon which he built a city named after him, Ferozeabad ; this city he watered with another canal from the river Jumma. These public works were of prodigious advantage to the adjacent countries, by supplying them with water for their lands, and with a commodious water-carriage from place to place.’

“ We learn also from the Ayin-Acbaree (vol. ii. p. 107, English translation) that Feroze founded the city of Hissar, called also Hissar-Feroozeh, and dug a canal from the river Jumma to it ; and we find, moreover, that the canal from the Jumma at Kun giparah to Delhi was the work of Feroze, and is probably one of the seven canals mentioned by Ferishta. I apprehend then that Hissar, or Hissar-Feroozeh, of the Ayin-Acbaree, is the same with the Ferozeabad of Ferishta. But possibly Feroze might only

embellish and increase the fortifications of Hissar, and then give his name to it, a practice very common in Hindoostan, to the utter confusion of historic records, and with no less injustice to the original founders. The town of Sursutti, by the authority of MS. maps and other circumstances, I place on the river of that name, between Tannasar and Kythil, (or Kuteil,) and Hassi, or Hansi, on the west, or rather south-west of Kythil. Hissar, or Feroseabad, will occupy a place still farther to the south-west, and in this position will be about seventy-five cosses from Delhi, in a west or north-west direction, and about 100 miles from Setlege or Suttuluz, at the nearest part of Debalpour, from whence the canal was said to be drawn. The rivulet of Kerah I can no more trace than the Lidger, but I think it will appear as clear to the reader as to myself when the text and the different positions in the map are considered, (I suppose him to have now before him the last complete one published of Hindoostan) that these canals had for their immediate object the junction of the Setlege and Jumma rivers, and remotely that of the Indus and Ganges, although they do not allow us to comprehend the whole scope of Feroze's plan of inland navigation. By a slight inspection of the map, it will appear that this project would, if the ground admitted of its being successfully put into execution, be one of the greatest undertakings of the kind that ever was projected; that of cutting through the isthmus of Suez only excepted. We should then have seen two capital rivers, which traverse a large part of the continent of Asia, which enter the sea 1500 miles apart, and which stretch out their arms, as it were, to meet each other, united

by art (canals) so as to form an uninterrupted inland navigation from Cabul to Assam. I take it for granted that this canal was never completed, otherwise we should have heard more of it, as we have of the canals before described, leading from the river Jumma. The distance between the navigable parts of the Jumma and the Setlege is not above 120 miles direct.

“ The Ganges and Burrampooter rivers, together with their numerous branches, intersect the country of Bengal (which, independent of Bahar and Orissa, is larger than Great Britain) in such a variety of directions, as to form the most complete and easy inland navigation that can be conceived. So equally and admirably diffused are those natural canals, that little is left for art to perform in a country which approaches so near to a perfect plane, that, after excepting the lands contiguous to Burdwan and Birboom, &c. &c. which may be reckoned about a sixth part of Bengal, we may safely affirm that every other part of the country has, even in the dry season, some navigable stream within twenty-five miles at farthest, and more commonly within one third of that distance.

“ It is supposed that this inland navigation gives constant employment to 30,000 boatmen, nor will this excite our surprise when it is known that all the salt, and a large proportion of the food consumed by 10,000,000 of people, are conveyed by water within the kingdom of Bengal and its dependencies. To these must be added, the transport of the commercial exports and imports, probably to the amount of 2,000,000 sterling, per annum, the interchange of manufactures and productions throughout the

whole country, the fisheries, and the article of travelling. The vessels made use of vary in bulk from 180 tons down to the size of a wherry. Those from thirty to fifty tons are reckoned the most eligible for transporting merchandise.

“ The rivers are in a tranquil state from the time of the change of the monsoon, in October, to the middle of March, when the north-westerns begin in the eastern part of Bengal, and these winds are the most formidable enemies that are met with in this inland navigation; they are sudden and violent squalls of wind and rain, and, although of no duration, are often attended with fatal effects, if not carefully guarded against: whole fleets of trading boats have been sunk by them.

“ During the long interval between the rainy season and the beginning of the north-westerns, the navigator is secure with respect to weather, and has only to observe a common degree of attention in piloting clear of shallows and stumps of trees; the rate of motion must principally determine that of the boat, for the motion acquired by the oars of a large budgerow\* hardly exceeds eight miles a day, at ordinary times. From the beginning of November to the latter end of May, the usual rate of going with the stream is forty miles in twelve hours, and during the rest of the year from fifty to seventy miles in the same time. The country, as I observed

\* A budgerow is a travelling boat, which is used in these inland navigations, constructed nearly like a pleasure barge; some of them have cabins fourteen feet wide and proportionably long, and which are fitted up genteelly, according to the company they carry and price of carriage. These boats draw from four to five feet water.

before, is nearly a plane ; to prove which, a section of the ground, parallel to one of the branches, in length sixty miles, was taken, and found to have only nine inches descent in a mile ; but the windings of the river were so great as to reduce the declivity, on which the water ran, to less than four inches per mile. The medium rate of the motion of the Ganges is less than three miles an hour in dry months. In the wet season, and during the draining the waters from the inundated lands, the current runs from five to six miles an hour ; but there are instances of its running seven and eight miles an hour."

## SECTION III.

*Particular account of the Canals in Russia; the first begun by Colonel Breckell, a German, who failed in the attempt, and fled the country in disguise; Captain Perry, an Englishman, was next employed by the Czar, Peter the Great—Three different surveys of Captain Perry—Great extent of this Navigation, and amazing trade carried on it between China and Russia.*

PETER the Great, Czar of Muscovy, having observed, whilst in Holland, that the industrious inhabitants of that country had, by diligent perseverance, and principally by means of canals, raised a small tract of marshy land into a populous and powerful state; this great prince, among his other grand designs, formed the plan of having an inland navigation for conveying the rich commodities of Persia to his new city of Petersburgh. They were first to be transported by the Caspian Sea to Astracan, and thence through the mouth of the river Wolga, and by a conjunction of canals into the river Mesta, and the lake Novogorod; and thence into lake Ladoga, and by the river Neva to Petersburgh, being a course of 460 miles. He likewise projected a communication, between the rivers Don and Wolga, which were to join the river Occa by another canal, and thus effect a navigation to Moscow by the river Mosca, and afterwards, by several other canals



of communication, through the river Dwina to the city of Archangel, on the White Sea ; and lastly, the productions and commodities from Archangel and the adjacent countries were to be conveyed through the river Onega into lake Onega, by a canal, and also through lake Ladoga, which lies at the foot of the Gulph of Finland, and by the river Neva to Petersburg. But the death of this great monarch prevented the completion of this noble undertaking, which would have rendered Petersburg the most populous city and best place of traffic in the world.

In the year 1698 this work was begun by a Colonel Breckell, a German, who was a Colonel in the Czar's army, and who had the reputation of a good engineer, as to fortifications, but very little understood the business of making canals. The first sluice that he made was blown up ; the water taking its course under the foundation, on the approach of the first flood, and before it was well completed, at the first shutting the gates ; in consequence of which Breckell, when he went to Moscow the following winter, obtained a pass, as for one of his servants, whom he pretended he must send for some necessaries for the work, and with the said pass made his escape out of the country.

During this first year he had 12,000 men under his command, employed in digging, cutting down timber, &c. &c. &c. whose time and labour were all lost in one night.

This year the Czar of Muscovy was in England, (on his tour of Europe) and by the recommendation of the Marquis of Carmarthen and Mr. Dummer, the surveyor of the navy, engaged and employed Captain John Perry as a person every way qualified

to serve his Majesty, as well in his designs in establishing a fleet, as making his rivers navigable, where not so by nature, and cutting artificial canals to join them, to effect an inland navigation through a great part of the country. Captain Perry was engaged at a salary of 300*l.* sterling a year, and twenty-five roubles\* per month subsistence money, with all travelling charges, besides the promise of a handsome reward at the conclusion of any work.

Captain Perry was immediately sent to Moscow, with orders that on his arrival there he should be directly forwarded to the province of Astracan, seventy-five miles beyond Moscow, to survey the work that Colonel Breckell had begun; and on his arrival there he found the work blown up and Breckell gone, as has been before related.

Upon this work Captain Perry was employed three summers successively, with orders to have 30,000 men to work; but he seldom had above half that number, and the last year not 10,000 men, nor the necessary materials sufficiently provided; for the governor of Astracan, and all the principal boyars or nobility of that country, obstinately opposed the undertaking, declaring it to be impossible to be effected by the hands of men. The governor represented it to be burthensome to the country, from the great number of men employed in it, and used all his endeavours to cause it to be abandoned as impracticable; saying, that God had made the rivers to go one way, and it was presumption in man to think or attempt to turn them another.

The Czar having been defeated by the Swedes at the battle of Narva, in the latter end of the year

\* A rouble is 4*s.* English, and sometimes 4*s.* 6*d.*

1701, Captain Perry received orders to attend the Czar at Moscow, and to let all the work stand still, leaving one of his assistants there to take care of what was done, some of the sluices being finished, and others nearly so, and the canal half dug.

In the year 1702 Captain Perry was sent to Veronize, a city situated on a river of the same name, which falls into the river Don, to fix on a place near the mouth of that large river, to lay the Czar's navy upon blocks on dry land, to repair, by damming up the river, &c. which navy was to act against the Turks. And here I will leave Captain Perry till the year 1707 or 1708, building and repairing ships of war, (one being of 80 guns,) making a dock yard, sheds for the ships to lie dry, warehouses, storehouses, &c. &c. &c.

The Czar having, at this time, formed the great design of building a new city at the mouth of the river Neva, which runs out of lake Ladoga into the Baltic Sea, Captain Perry was again called from ship building, and ordered to attempt three several ways to cut canals from the great river Wolga, and other rivers, to bring timber, provisions, &c. &c. from the interior parts of the country to the new city of Petersburg.

Captain Perry, therefore, departed with assistants, from the side of lake Ladoga to the river Wolga, to trace the several rivers as they fall into each other, to the places where, at the heads or first springs from whence they take their rise, or where they approach nearest, and a communication may be the easiest effected. He accordingly took the descent or difference of the level of the said several rivers as they fall down into the Wolga on the one side of the

country, and discharge themselves into lake Ladoga on the other, with such observations as were necessary to be made, and returned at the end of the year 1710 to give an account to his Majesty of what he had done, who was then at his new city of Petersburg, and to lay before him the drafts, levels, rises and falls, and a report of the properest place, the time requisite, and the expences necessary for making such communications, by the way of the river Koefsha, lake Beila, and the river Shacksna, on the one side of the country, falling into the Wolga, near the town of Rebna; and by the way of the river Whitegor, lake Onega, and the river Swire, falling into lake Ladoga, on the other side of the country; where it was necessary to construct twenty-two locks or sluices, and to cut an easy canal not above three English miles in length. A draught of this intended communication, and an estimate of the time and expence which would be necessary for its completion, he presented to the Czar, who received them very graciously.

The following short abstract of the survey will probably not be unacceptable to the curious reader.

The first survey of the country was by the way of the rivers Sass and Tiffin, to the top of the high land within the country, whence an arm of the river Tiffin takes its first rise. He followed the same the whole way, with abundance of falls, descending into lake Ladoga, through a distance of 174 Russian wersts,\* winding as the rivers take their course, to be a difference of level of 897 English feet, and from the top of the said high land, in running on

\* A Russian werst is just three-fourths of an English mile.

the other side of the country, 420 wersts down the rivers Chacodoshea and Molloga ; to the place where the river Shacksna falls into the Wolga the descent was found to be 562 feet.

The second route Captain Perry took was by the way of the river Emsta, and lake Elmena, and the river Volkoff, falling into lake Ladoga ; in running a course of 550 wersts the descent was found to be 568 feet ; and on the other side of the country, southward, descending by the way of the river Twere and Wolga, as far as the mouth of the river Shacksna, aforesaid, in running 720 wersts, the descent was found to be 233 feet.

The third route of the said engineer was by the way of the river Whitigor, lake Onega, and the river Swire, falling into lake Ladoga ; and in the running of 278 wersts the descent was found to be but 445 feet from the top of the highest land, where the rivers come nearest for a canal to be cut ; and the descent down on the other side of the country, in running 418 wersts, by the way of the rivers Keofsha, lake Beila, and Shacksna, falling into the Wolga at the same place, before-mentioned, only 110 feet.

This being the lowest or most level part of the country, attended with the least falls, and requiring the least number of locks to be made, and the rivers Swire and Shacksna and a great part of the rivers Keofsha and Whitigor, being already navigable for small vessels, which pass the whole year backwards and forwards, except only when the rivers are frozen, Captain Perry, therefore, recommended to the Czar this last survey, as abundantly preferable for making the intended communication and canals.\*

\* See Perry's State of Russia.

What was left undone by Peter the Great has been carrying on and completing with the utmost assiduity by his successors ; and a communication is now effected from the Baltic and the Caspian Sea, by which a navigation is opened to Persia ; a new communication with the river Wolga is likewise undertaken, the old one being found so dangerous as to be almost useless.

Several other works of this kind are carrying on for the benefit of trade and commerce, by order of the late Empress, in different parts of those dominions ; and the most experienced and able engineers have been engaged from every country in Europe, which will not fail to render Petersburg, what Peter the Great intended it should be, the emporium of the north, if not of Europe.

A short sketch of the works carried on in Russia for the improvement of inland navigation, since the death of Peter the Great, some of which, as I before observed, were begun by him, and perfected by his great successors, will shew the attention there paid to the internal commerce of that vast country ; and when we consider the great labour, and prodigious sums of money those canals must have cost, we shall be astonished that they were ever completed, as Russia has been almost continually engaged in expensive wars since they were first undertaken.

There is, perhaps, no part of the world where inland navigation is carried through such an extent of country as in Russia, it being possible in that empire to convey goods by water 4472 miles, from the frontiers of China to Petersburg, with an interruption of only about sixty miles ; and from the city of Astracan, on the Caspian Sea, to the same

capital, 1434 miles. A most astonishing tract of inland navigation, almost equal to one-fourth of the circumference of the earth.

The communication, by water, between Astracan and Petersburg, or between the Caspian Sea and the Baltic, is formed by means of the celebrated canal of Vishnei-Voloshok. This great work, which was begun and completed by Peter the Great, has been so much improved, by the late Empress, that vessels now reach Petersburg in less than half the time they formerly did.

By examining the map of Russia, we shall find the Twertza joins the Wolga at Iver, that the Shlina forms the lake Mastino; which gives rise to the Masta, and the latter falls, after a course of 234 miles, into the lake Ilmen, which issues the river Volkof, which runs 130 miles to lake Ladoga, and supplies the Neva, so that in effect the Shlina, the Masta, the Volkof, and the Neva may be considered as the same river flowing into and through different lakes, changing names at intervals. By uniting, therefore, the Shlina, which communicates with the Baltic, with the Twertza, which flows into the Wolga, and by that river into the Caspian Sea, is formed the junction of those two seas. This junction is made by the canal of Vishnei-Voloshok, where the Shlina is united to the Twertza by the following canals and rivers.

Close to Vishnei-Voloshok the Shlina is formed by the confluence of two rivers, Shlina and Zna; near the latter are the sources of the Twertza. In order to join the Twertza with the Zna, the following works were made by the Czar Peter.

Near the village of Klutshina a canal was dug to a small lake of the same name; a second canal was dug to the lake Gorodolub, and a third from

thence to the Zna. At the same village, just below the first canal, a lock of four gates was constructed across the Shlina, in order to stop the course of that river, and, by means of the aforesaid canals and lakes, to convey water into the Zna above Vishnei-Voloshok. But to keep always this supply of water in reserve, and to let as much into the town as is judged necessary, a great lock of seven gates was constructed across the Zna, below the third canal. The Zna and the Twertza were united by a canal, beginning at the source of the latter; and at the end of the canal a lock was made. The natural course of the Zna was shut up by two locks in the town, one of which may also serve for a passage. A canal was also dug from the Zna to the Shlina, at the end of which is the lock at Zna. The several canals are supplied with water, and the vessels are navigated from the Twertza into the canal of Zna, by the following operation of locks.

The locks of Klutshina, and those in the town of Vishnei-Voloshok, and that of the Zna being shut, the lock of the Twertza is opened; the waters of the Zna and Shlina are conveyed through the canal of the Twertza into that river, and the barks and barges pass into the Zna at Vishnei-Voloshok; when a sufficient number has been admitted, the lock of the Twertza is shut, and the waters being raised to a certain level, which it takes two or three days to effect, by means of the lock of seven gates, that of the Zna is opened, and the vessels are gradually let down a small fall, to the number of twenty in an hour. At night the lock is shut, if on the next day there is a proper depth, the vessels keep descending through the lock of the Zna, or, if not, they must



remain for a day or two, till there is water enough collected. Having, by these means, all passed into the Shlina, they proceed without interruption through the Lake Mastino to the beginning of the Masta, where a lock has been lately constructed, which holds the waters of this lake in reserve. By this reservoir the navigation is so greatly facilitated, that the lock of the Zna being shut, and that of the Twertza open, the latter river, which formerly was almost dry for several weeks, is now generally navigable, even in the midst of summer. Within two or three days after the passage of the vessels in the spring, the supply of water, from the melting of the snow, is so very considerable that the locks, both of the Twertza and of the Zna, are open at the same time.

With respect to the navigation of the Masta, several rivulets falling into it are confined by locks, which being opened successively, as the vessels are passing, fill the river, and render the shallows passable; and being again closed, hold perpetual reservoirs of water for the same purpose. This operation is performed five or six times in the summer. By some other works lately constructed, a considerable addition of water has been obtained, and it is expected that the Twertza will become always navigable, and that the lock of the Masta will only be shut for a short time.

The boats employed on this occasion are towed by ten horses, at the rate of ten or twelve miles a day, up the Twertza to Vishnei-Voloshok, from which place they are rowed as far as Novogorod; each vessel is provided with ten men, those which are laden with hemp require twenty men. At Noshino and Bassatino they change pilots, and take in ten additional men to

pass the upper and small cataracts. At Apezenskoi-Radok, which stands at the head of the great cataracts, they procure another pilot and two assistants, and, on account of the rapidity of the current, increase their complement to sixty men. The fall of the river is  $122\frac{1}{2}$  yards perpendicular in twenty miles, being scooped out of solid rock, and the stream is so violent that the vessels shoot along this space within an hour; they have been sometimes dashed against the rocks, or upset by accident; in the year 1778 above thirty vessels were lost at one time.

From the foot of the great cataracts the pilot of Vishnei-Voloshok steers the vessel 120 miles further down several shoals, which, however, have been considerably reduced and almost levelled. In spring the vessels are allowed to draw two feet and a half water, in summer only two feet two inches. In autumn the navigation from Vishnei-Voloshok to Petersburg is performed in little more than a month; in the summer, three weeks; and in spring, only a fortnight. In the year 1777, 3485 vessels passed through this canal; this alone shews the amazing internal trade of Russia, and this from one quarter of the country only. The vessels being steered down the Masta, across Lake Ilmen to Novogorod, descend the river Volkof; and the Ladoga canal, which does not enter into Lake Ladoga, but passes up to near the mouth of the river Volkof, and winds its course, on the borders of Lake Ladoga, into the river Neva, which it enters near the village of Schlussemburg and proceeds to Petersburg.

This canal was begun in 1718, by Peter the Great, and was finished during the reign of the

Empress Anne. It was carried at first only as far as the village of Kabona to a rivulet of the same name which falls into the lake to the east of Schlusselfburg, but now reaches, without interruption, from the Volkof to the Neva. Its length is sixty-seven miles and a half, and its breadth seventy feet; its mean depth of water, in summer, is seven feet, and in spring ten feet; it is supplied by the Volkof and eight other rivulets, the latter being received into reservoirs, and are admitted into the canal by flood-gates, and the superfluous water is discharged through an equal number of openings on the opposite side. The vessels enter through the locks and sluices of the river Volkof, and go out through those of Schlusselfburg. In 1778 no less than 4927 vessels passed through the canal of Lake Ladoga, an increase of inland commerce of almost one-fourth in one year, by means of canal navigation.

A scheme has been projected to form a canal and deepen rivers to make a navigation from Archangel to Petersburg; it goes on very slowly, only about seven miles are finished.

The grand project of uniting the Caspian Sea to the Baltic, and also to the Black Sea, by a junction of the river Don with the Wolga, was planned by Peter the Great. These two rivers approach each other to within forty miles distance in the province of Astracan, and the two rivulets Iloffa and Camashinskaja, the former of which falls into the Don, and the latter into the Wolga, are separated by an interval of land of only five miles; could these two rivulets be made navigable, and united by a canal, the Black Sea would be joined to the Caspian Sea and the Baltic. With this view Peter sent Captain

Perry, as before observed, to the spot; the canal was begun under his inspection, and a cut was actually made of a mile and half in length; but the scheme was then dropped for reasons before mentioned. It has been revived, however, by the late Empress; and professor Lovitz was intrusted with the execution of it; and having traced out the ground as before, had begun the work, when, in 1774, he was wantonly murdered by the impostor Fugatschef. Lovitz found the plan of Captain Perry to be right; but that the greatest difficulty would be in deepening the beds of the two rivulets and procuring a supply of water sufficient to make them navigable.\* As the Wolga and the Don are but forty miles distant, and land carriage in this country very cheap and easy, and as so many obstacles, by the stupid natives, are thrown in the way, I much question whether the canal will ever be finished.

I hope not to be deemed prolix if I here add a short account of the frontier places of commerce between the Russians and Chinese, the commodities in which they traffic, and the route of the Russian inland navigation.

At a great distance up the river <sup>\*\*\*</sup>Yenisoj, which empties itself into the Frozen ocean, or sea of Kara, beyond Nova Zembla, near a town called Yeniseik, a large branch takes an immense sweep to the north-east. This branch is called the Zunguska river, and

\* The author of this history was sent, in 1783, to push on this work, and had 700 men ordered to dig, and cut down timber, &c. but after being there nineteen months with often not 100 men, and as no carpenters were sent him, nor were other artificers to be had, while every possible obstacle was made by the Boyars to hinder the work; he returned to Petersburg, without doing any thing but cutting down a few thousand timber trees,

after running full ten degrees in that direction, turns nearly due south. Out of it fork several rivers, called the Ilim, Irja, Oka, and Angara, which last is the principal, and forms a very large body of water, not less than eight degrees in length and two in breadth, called the lake of Braikel, in which are a great number of islands, some of them very large. From nearly the middle of the lake lengthwise, another large river goes off still farther south; on the first branch of which stands the town of Udinsk; and on the second branch, the town Selingsk, which is the chief town of the frontier government of Russia. The next branch is called the Kiatker, and on the fork of this river is the Russian town Kiatka; and on the opposite side of the river the Chinese frontier town Maitmatschin, which is their commercial town at the extremity of the Chinese frontiers next to Russia. At this place the rivers Tchikoi, Bura, Tola, Orchon, and Selenga go off, and some of them branch again and end in lakes. The Russian town Kiatka lies (according to Pallas's Travels through Siberia to China) in lon.  $124^{\circ} 18'E$ . from Ferro, and lat.  $51^{\circ} N$ . and is distant 3676 miles from Moscow, and 1025 from Pekin. The frontier Chinese town, Maitmatschin, is on the opposite side of the river, which is only 140 yards wide, and lies to the south of Kiatka.

The principal commodities which Russia exports to China, are furs and peltry; the most valuable are the skins of sea otters, beavers, foxes, bears, bucharian lambs, Astracan sheep, martens, sables, ermins, grey squirrels, &c. cloths, English, Prussian, and French camblets; calimancoes, druggets, white flannels, rich stuffs, velyets, coarse linen, Russia

leather, glass ware, looking-glasses, hardware, as knives, scissors, locks, &c. tin, Russia talc, camels, horses, and horned cattle. The Chinese also purchase, at a great price, greyhounds, hounds, barbets, and dogs for hunting wild boars.

At Kiatka the finest Hudson's Bay beavers have been sold at 20 roubles a skin, or about five pounds English money, and otter skins at 35 roubles, or eight pounds twelve shillings, and the best Canada black fox skins have been sold for 100 roubles, or twenty pounds English money each.

The commodities imported from China by Russia are, raw and manufactured silk, (the raw is prohibited in China under pain of death, but it is smuggled to Kiatka,) raw and manufactured cotton; teas of the best sorts; porcelain, japan cabinets and cases; lacquered and varnished tables and chairs; boxes inlaid with mother of pearl, &c. fans, toys, and small wares; artificial flowers, tiger and panther skins; white lead, vermilion, and other colours; canes, tobacco, rice, sugar-candy, preserved ginger, and other sweetmeats; rhubarb, musk, &c. &c.

The Chinese transport their goods to Kiatka chiefly on camels; it is five days journey from Pekin to the Chinese wall, and forty-six more to cross the Mongol desert to Kiatka.

In going to Kiatka they make the greatest part of their journey by land, for two reasons; one is, that in most of the rivers the streams are rapid, and run the contrary way, which they take the advantage of in returning; and the other, that in the journey by land, they collect in their route skins and furs, and various small articles for private trade.

The Russian commodities are transported by land

from Petersburg and Moscow to Tobolsk from thence the merchants sometimes embark upon the river Irtysh, and go down to its junction with the Oby; then they tow their boats up the Oby as far as Naryn, where they enter the river Ket, which they ascend to Makoffskoi-Ostrog, at which place the merchandise is conveyed about sixty miles by land to Yenirei; they then ascend that river, and the Tunguska and Angara to Irkutsk, cross the lake Baikal, and up the river Selenga to Kiatka. It is a voyage of such difficulty against the streams eastward, that it is hardly finished in a summer; for which reasons the merchants often prefer the way by land, and rendezvous at the fair of Irbit, near Tobolsk, from whence they go in sledges, during the winter, to Kiatka, where they arrive about February, the season in which the chief commerce is carried on with the Chinese. But on their return they descend by the rivers Selenga, Angara, Tunguska, Ket, and Oby to the junction of the latter, to the Irtysh; they then ascend that river to Tobolsk, and go up the Tobolsk river into the river Iset, at the head of which is a small lake, whence a canal is cut into the river Tchusovia, which falls into the Kama, which latter river falls into the Wolga, near Kasan. The navigation of the Wolga by Tzwer and Vishnei-Voloshok to lake Ladoga and Petersburg I have before mentioned.

In order to give the reader some idea of that vast country over which merchandise is frequently transported by land carriage, in the journey from Petersburg to Kiatka, I shall add the following list of distances.

From Petersburg to Moscow 734 wersts; from Moscow to Tobolsk 2385; from Tobolsk to Irkutsk 2918; and from Irkutsk to Kiatka 471; in all 6508 wersts, or 4338 English miles and two-thirds of a mile: but the distances by the rivers are much greater, as has been already observed.



## SECTION IV.

*A full Account of the Canals of Sweden and Denmark, together with a Description of the Canal of Kiel in the Dutchy of Holstein ; its Utility, by effecting a Junction between the Baltic and the German Ocean.*

**SWEDEN** has long been sensible of the utility of inland navigation ; the following account is chiefly extracted from the Travels of Mr. Coxe, of the most remarkable works of this kind that have been constructed or projected in that country.

At the village of Trolhaetta in the province of Gothland, and on the river Gotha, close to the cataracts of that river, and near the entrance into the great lake Wenner, begins a stupendous work, intended to open a passage for vessels by means of a navigable canal, called from this place the canal of Trolhaetta.

This canal forms part of a plan long projected by the Swedes to unite the Baltic and the German Ocean by an inland navigation, as well for the purpose of improving the interior trade of the provinces, as of preventing the interruption of their foreign commerce, which is the inevitable consequence of a war with Denmark ; for as all vessels sailing out of the Baltic must pass through the Sound, they are exposed to the Danish ships of war and privateers, which shelter themselves under the batteries of Elsineur, which

commands the passage of the Strat, unless a Swedish fleet should command the channel.

Gustavus Vasa was the first sovereign who perceived the utility of such an inland navigation, when he made Lodese, now Gotheborg, a staple town of trade, that the merchant ships coming to Sweden might not be obliged to sail through the Sound, and he conceived hopes that, at some future period, merchandise might be transported from thence to Stockholm by means of the lakes Wenner, Hielmar, and Maeler, when the rivers and lakes which join them should be made navigable. Eric XIV. desirous of carrying his father's designs into execution, gave orders for surveying the waters communicating with these lakes, and directed plans to be formed for joining them by artificial canals; but the execution of this great scheme was frustrated by the turbulence and misfortunes of his reign.

Several succeeding sovereigns had this great object in view. Charles IX. promoted it by the Carlsgraf Canal, and Charles XI. by that of Arboga. The undertaking, however, of forming a communication by water through the whole country, was always considered as a work of extreme difficulty. Motraye says, that Gustavus Adolphus was inclined to encourage the design, but as no person could be found in Sweden bold enough to engage in the enterprise, he adds, that Charles XI. sent for some Dutch engineers, who, after they had measured the falls of the waters between the lakes Wenner and Hielmar, declared it to be impracticable. Difficulties, however insurmountable they might appear to persons of more sober understanding, were no obstacle to the genius of Charles XII. The same author informs us that the

celebrated engineer Polhem laid before the king a proposal for rendering the cataracts of Trolhætta navigable; and for opening a communication not only between Gotheborg and Stockholm, but also with the lake Wenner, the Vetter, and Nordkiöping, sufficient for the passage of very large vessels.—Polhem's plans were directly approved, and begun by Charles, ever fond of extraordinary projects; and although it was interrupted for some time by the king's death, it was again revived, with fresh vigour, under the late sovereign Adolphus Frederic.

This plan may be divided into three principal parts.  
1st. The junction of the Hielmar with the Maeler.  
2d. That of the Hielmar with the Wenner, and  
3rd. that of the Wenner with the German Ocean.

First, the junction of the Hielmar with the Maeler. These two lakes are united by the small river Ulvison and the canal of Arboga; the former rises to the west of Arboga, flows through the town, and falls into the Maeler at Kungfaer. The canal of Arboga is cut from the Hielmar, and continued to Ulvison, about half a mile to the east of the town. It was begun in the reign of Christina, but being only calculated for small vessels, was widened and deepened by order of Charles XI. and completed under his successor Charles XII. It belonged to the crown. until 1769, at which period it had been so much neglected as scarcely to be of any use. But a company of seven merchants of Orebro undertook to cleanse and repair it at their own expense, upon condition of receiving all tolls of vessels that shall pass through it. The canal is, excepting a few parts, broad enough to receive two vessels a-breast; its depth is eight feet. It is chiefly supplied with water

from lake Hielmar, the surface of which is eighty feet perpendicular higher than its level ; it consists of eight sluices or locks. The vessels it admits are the same which navigate the lakes ; they are decked, and with one mast ; are seventy-six feet long, and forty-three tons burthen, and draw between six and seven feet water when laden.

2d. In order to join the Hielmar and Wenner, it was proposed to open the navigation of the Swartan, which falls into the western extremity of the Hielmar, at Orebro ; and to make a canal from that river to lake Morken, from thence, by the Leton, to the Skager, and from the Skager, by the Gullspang, to the Wenner. There is reason to conclude, from accounts of persons who have been on the spot and inspected the above mentioned rivers, that they are so shallow and stony that it would be very difficult and expensive to render them navigable ; and as the faint attempts hitherto made upon the Gullspang have all failed of success, it has been proposed to cut a canal directly from lake Morken to Christinehamn, which is situated on the eastern shore of lake Wenner ; but as no part of this project has been yet begun, and the whole would be attended with great difficulties, there is little prospect that this branch of the great undertaking will ever be completed. On account of the great difficulties attending this junction, a plan was projected to form an inland navigation from the eastern coast of Sweden, south of Macler, by means of the Wetter to the Wenner, and in 1774 a map was published to shew the scheme was practicable.

3rd. The junction of the Wenner with the German Ocean is next to be considered ; and this may

be accomplished by the river Gotha, which issues from the southern extremity of the lake Wennesborg, which, after a course of seventy miles, falls into the sea, near Gotheborg, provided that river could be made navigable its whole course; but as, on account of shoals and cataracts, its stream is greatly impeded, the communication has been attempted by the Carlsgraf canal, the canal of Trolhaetta and the sluices of Akerstroem and Edet, which, therefore, it is proper separately to describe.

The channel of the river Gotha not being open and free from its first issuing from the Wenner, a cut from a bay of that lake was begun by Charles IX. but was not entirely completed before the reign of Charles XII. Polhem, whom I have mentioned before, erected by order of that monarch a sluice, which not being constructed on a firm foundation, was scarcely finished before it was undermined and carried away by the water. From that time the Carlsgraf canal remained without a sluice, and consequently without a vessel passing it, until the reign of Adolphus Frederic. In 1754 a new sluice, was finished, which was called the sluice of Jessin, in honour of the prime minister of that name. It was formed by a subterraneous channel forty feet long, eighteen broad, and twelve high; but these dimensions were too small for the admission of vessels of more than forty tons burthen, and it frequently happened that even those could not pass whenever there was either too much or too little water. To remove these difficulties, another sluice was completed in 1768, called in honour of the King, Gustavus. This superb work is a channel 400 feet in length, the half of it is cut out of solid rock, and consists of two locks, each

200 feet long and 36 broad ; the sides are strongly faced with brick and stone. The greatest depth of water is thirteen feet, the lowest six feet. The usual vessels that navigate this canal are of eighty tons burthen, but when the water is high, larger may pass; in 1777 one vessel of 130 tons worked its way through.

From the end of this canal to Trolhaetta, which is five miles, the navigation of the river is uninterrupted, and flows in a gentle current ; it varies in its breadth from 300 yards to a mile. Near Trolhaetta two ridges of mountains, which on each side run at a small distance from the river, approach its banks, and confine its stream within a narrow channel ; in this place it is about 400 feet broad, as smooth as a lake, and without any visible stream, exhibiting a striking contrast to the roaring of the torrent below. This smoothness of the water continues till it bursts at once into the cataracts of Trolhaetta, called the gulfs of hell, which render all further navigation impossible. The bed of the river is solid rock, the banks are perpendicular, and at the beginning of the fall several granite islands, thinly covered with underwood, junipers, and stubbed pines, rise in the midst of the stream, down which the water dashes with increasing impetuosity.

From the opening of the fall to the part where the river again becomes navigable is about two miles; but it does not roll through the whole of this space in one uniform sheet of water, or with equal violence. It is divided into four principal cataracts, separated by whirlpools and eddies, and forming, during the whole way, the most awful scenes, ever varying and so sublime to be accurately described. The per-

pendicular height of all the falls considered as one is about 100 feet. From this description the reader will readily perceive the extreme difficulty of rendering the cataracts navigable, yet it was through the midst of them that the daring projector attempted to form a canal by the works I shall now proceed to describe.

Just above the first cataract, called Prastenkesdet fall, several dams were constructed to turn the stream, and left the main bed of the river quite dry. In this part some rocks were cut through, and others blown up, the bed was rendered level, and the cataract nearly turned into still water. To continue the navigation, an island of red granite, which rises in the midst of the great cataract, was divided, and a canal formed through it of 340 feet in length, including a sluice of 30 feet. The depth of the fall, and of course the perforated rock, is 23 feet 4 inches, the breadth 18 feet. This is called Ekerbrad sluice, and was designed to consist of two locks. At a small distance another canal was formed on the side of the second great cataract, through a kind of promontory which projects into the stream. The solid rock of granite was hollowed 860 feet in length, 56 feet 6 inches in depth, and 18 feet broad. This sluice was called Polhem's sluice, and was to consist of three locks, by which vessels were to be let down a fall of 56 feet 6 inches. At the distance of 2920 feet, a third cut was made to the Flatesberg fall, terminating in the sluice of Elvius, the last of this projected plan. The length of the cut is 28 feet, the breadth 18 feet, and the fall 34 feet 3 inches. In order to form some idea in what manner the navigation was to be continued from the sluice

of Polhem to that of Elvius, it will be necessary to describe the intervening space.

A little below the sluice of Polhem, the river dashes through a narrow passage called Stampstroëm; from thence it gradually widens into a kind of bay, named Hoyon's Warp; it is again cramped into a narrow channel, by the nearer approach of rocks on each side, and forms a cataract called Helvert's Fall, at the extremity of which it expands itself into a small bason called Ali-Halla, and then again precipitates itself at the Flatesberg Fall, from whence it becomes navigable. Instead of continuing any works through the cataracts, or by the side of the river, the communication between the sluices of Polhem and Elvius was attempted in the following manner. A dyke of stone was constructed across the river just below the Flatesberg Fall and the sluice of Elvius, and forming a level with the bottom of Polhem. This chimerical project, which seems rather too ridiculous to be seriously entertained, was, however, attempted. The king himself visited the work, and all Sweden was in eager expectation that the favourite project of the nation would at length be completed. The dyke was built, and the river had risen twelve feet of the thirty-four, when, in an instant, the weight of water above burst the barrier, too feeble to restrain it, and instantaneously swept away the labours, and also the expense of several years. The immensity of the expense will be best conceived by considering that all the cuts were made through solid rocks of granite. Large subsidies had been annually raised for the prosecution of the work, and the national bank had readily advanced great loans, the sum total of which has never yet



been divulged. The failure of the project, after such immense labour and enormous expense, occasioned great discontents among the people, many of whom, to this day, believe, though there seems no grounds for it, that the projectors were bribed by the Danes, and proceeded upon a plan which they knew would not succeed. But thus much is evident, that throughout the whole undertaking, the works, stupendous in themselves, were conducted without proper care and attention; for after all, the cuts, which had been excavated with such difficulty, being only eighteen feet broad, would have been too narrow to have admitted vessels of such size and burthen as usually navigate Lake Wenner. In a word, several ill-judged measures have been taken; otherwise, although there were many natural obstacles to surmount in this enterprise, yet greater obstructions have been surmounted. But Polhem was not a Brindley.\*

In consequence of this failure, all the works and sluices hitherto raised were neglected, as totally useless, and a new plan for a canal at Trolhaetta has been projected; according to which, instead of being carried, as before, along the channel of the river, it is to be cut through the solid rock that forms its

\* The author of this history on his return from Russia, in 1785, landed at Stockholm, and came through Sweden, and passed this stupendous work in his way to Helsingør to go over to Elsinør into Denmark. He was in company with a gentleman who belonged to the Swedish court, who asked a variety of questions, if he thought it really were practicable? he replied, he thought it was, but with a vast expense and trouble; and also said, if it were in England, where such wonderful advantages would accrue, engineers would be found to complete it; and that Vishnei-Voloshok, in Russia, was nearly as expensive and troublesome.

**banks.** The plan of this last project is thus described : the length is to be 4700 feet, and 36 feet broad, and the depth in some parts 50 feet ; it is to consist of nine sluices ; and, when we reflect that the whole of this cut must be hollowed through the bed of red granite, it is evident that it will be attended with many, if not more difficulties than were experienced in the former attempt. It must by no means be condemned as impracticable. The canal of the Duke of Bridgewater ; that of Languedoc, and the road through the mountain Gemmi, in Switzerland, prove that scarcely any thing is impossible to human industry.

The chief question in this respect seems to be, whether the enormous expense attending the execution of the work will be compensated by the advantages resulting from its completion ? And here, if we only take in the navigation from the Wenner to Gotheborg, we may venture to decide in the negative. But if we presume that, at any future period, a communication will be formed from the Gulf of Bothnia to the Wenner, the accomplishment of this canal could not be obtained at too dear a rate to remove or pass the cataracts of Trolhaetta.

His late Majesty of Sweden, soon after his accession, visited those works at Trolhaetta, and wisely ordered them to be suspended for the present, but that the sluices of Aker and Gustavus should be finished without delay. Meanwhile, in order to facilitate the transport of merchandise from the districts bordering on the Wenner to Gotheborg, a wooden road has been constructed on the side of the river, from the beginning to the end of the cataracts. It is supported by very large posts over the rocks,

which, from their irregularity and roughness, would have been almost impassable for horses.

About a mile below the cataracts, the course of the river Gotha is again interrupted by a fall, called Akerstrøm. Here a canal has been made through a rock which projected into the river; the length of it is 182 feet, the sluice included; the depth 26 feet, and breadth 36 feet; this cut was begun in 1774, and expected to be opened in 1781.

From Akerstrøm the river is clear to Gotheborg, excepting at Edet, where its passage is stopped by a bed of rocks rising in the midst of the stream. On one side of these rocks another cut has been made 600 feet in length, 20 in depth, and 18 broad. This work is ill-executed, and in bad order. A petition has been presented to the king that it might be repaired, and improved to the same breadth as Aker sluice, and there was no doubt but that it would be done.

The iron and other merchandise is now conveyed over the lake Wengersborg, and thence through the Carlsgraf canal, and down the river Gotha to Trolhaetta. Upon coming to the cataracts, the goods are unloaded, and carried along the wooden road about two miles to the end of the falls. There they are again embarked, and passing through the Akerstrøm and Edet sluices (supposing they are now completed) arrive, without further impediment, at Gotheborg. In return, salt, spices, corn, tea, and other commodities of interior consumption are sent up by the same channel into the provinces about the lake Wenner.

Thus, for more than a century, the schemes and efforts of all the engineers employed in Sweden, both

natives and foreigners (except English engineers) to construct works of the greatest importance to the country, failed of success. In England, if I may be permitted the observation, (as I told the Swedes), were the same advantages to be expected from surmounting equal difficulties, I have not a doubt but engineers would be found to accomplish such an undertaking, and private individuals to undertake and complete it, without any assistance from government. It would be honourable to our country, and doubtless would prove advantageous to the individual, should any one of its well-informed engineers go over and inspect it; as there can be but little apprehension, should the report of his opinion encourage the idea, that this desirable work might yet be brought to perfection, but the Swedes would use every exertion for its accomplishment.

#### DENMARK.

Before I particularly describe the canal of Kiel, it may not be improper to give a short account of that capital of Holstein, it being a part of his Danish Majesty's dominions, to form an idea of the usefulness of that great undertaking.

Kiel possesses a university for the German subjects of Denmark, which was founded in 1650, by Christian Albert, Duke of Holstein Gottorp, and has lately been considerably enlarged by his present Majesty. It contains twenty-four professors, and about 300 students. The city stands on a small peninsula in a bay of the Baltic, and has a very commodious harbour for ships of the largest size. It is one of the most commercial places of Holstein; and its trade will be greatly augmented when the

inland navigation across the peninsula shall be completed.

The inland navigation for the junction of the two seas, is to be formed through the duchy of Holstein, by the canal of Kiel and the river Eyder, which runs by Rendsburg, and falls into the German ocean at Tonningen.

This canal begins about three miles north of Kiel, at the mouth of the rivulet Lewen-sawe, which heretofore separated Holstein from Sleswick, and will form a new boundary between those two duchies. The distance from the beginning to the last sluice at Rendsburg is twenty-seven English miles; but, as the river Eyder is navigable about six miles and three quarters above Rendsburg, and only requires to be deepened in some places, the cut which is necessary for its completion, between the two seas, will be only twenty miles and a half.

The canal was begun in 1777, and in April 1779 it had been cut about six miles, as far as Succdorf; and it was computed that the whole would be completed in 1784. The work was performed by contract; 1024 cubic feet\* of earth were to be taken out for eight shillings, and the whole expense to amount to about 200,000 pounds.

\* Between the Flemhuder and the river Lavens is the highest point, on each side of which the waters take different courses to the Baltic and German ocean; in this part the ground must be opened to the depth of fifty feet. The perpendicular fall towards the Baltic is twenty-five feet six inches; and that towards the German ocean twenty-three feet; and the vessels will be raised up or let down by means

\* The foot used in Denmark is to the English foot as 21 to 22.

of the six following sluices: Holtenau, Knorp, Suckdorf, Shinkel, Niederholten, and Rendsburg. The breadth of the canal is 100 feet at top, and 54 at bottom; the sluices are 27 feet broad, and 100 feet long, and the least depth of water is ten feet. The canal will be furnished with water as far Steinwarp from the Eyder, and the lakes Flemhuder and Wester, and from thence to Rendsburg by the lake Wetter, from which flows a rivulet that joins the Eyder. Common merchant vessels of about 120 tons burthen will be able to navigate this canal.

The utility of this important undertaking will be evident from a mere inspection of the map of Denmark. It may be observed that even the smallest vessels trading from any part of the Danish dominions, on the Baltic, to the Northern seas, must make a circuit round the extremity of Jutland, and are liable to be detained by adverse winds. This navigation is so tedious, that goods shipped at Copenhagen for Hamburg are not unusually sent by sea only to Lubec, and from thence, by land, to Hamburg. But the completion of this canal will enable vessels not exceeding 120 tons, or not drawing above ten feet water, to pass immediately from the Baltic into the German ocean, and proceed without unloading to Hamburg, or sail to Holland, England, or other parts, which, in time of war, receive supplies from Denmark.

## SECTION V.

*A short Description of the Canals of Holland and Flanders, and the extensive Trade carried on by them.*

THE industrious Hollanders, from mere necessity and hatred of their oppressors, the Spaniards, have, with the greatest labour, cut such a multitude of canals in every part of the low, narrow, swampy, boggy provinces they inhabit, which can scarcely, with propriety, be called land, that for commerce, riches, and population, they may now vie with any other country on the face of the earth in proportion to its size, even China not excepted.

One third, at least, of this country has been gained from the sea, by the means of vast dykes and mounds, some of which are twenty-one yards in thickness, and which must continually be kept in repair, with prodigious labour and wonderful expense, to prevent the whole country from being inundated.

The seven United Provinces, commonly called Holland, are intersected with innumerable canals, which it is not my intention to describe circumstantially, since that would be to give a geographical survey and history of the country. They may be compared in number and size to our public roads and highways; and as the latter, with us, are continually full of coaches, chaises waggons, carts, and horsemen going from and to the different cities, towns,

and villages, so, on the former, the Hollanders in their boats and pleasure barges, their trekschuyts and vessels of burthen, are continually journeying and conveying commodities for consumption or exportation from the interior part of the country to the great cities and rivers. An inhabitant of Rotterdam may, by means of these canals, breakfast at Delft or the Hague, dine at Leyden, and sup at Amsterdam, or return home again before night. By them also a most prodigious inland trade is carried on between Holland and every part of France, Flanders, and Germany. When the canals are frozen over they travel on them with skaits, and perform long journeys in a very short time, while heavy burdens are conveyed in carts and sledges, which are then as much used on the canals as in our streets.

The yearly profits produced by these canals are almost beyond belief; but it is certain, and has been proved, that they amount to more than 250,000 pounds for about forty miles of inland navigation, which is 625 pounds per mile, the square surface of which miles does not exceed two acres of ground; a profit so amazing that it is no wonder other nations should imitate what has been found so advantageous.

The canals of Flanders, Ostend, Ghent, Antwerp, Brussels, &c. cannot, at present, claim much praise. This country has had its day of commerce when Europe was in its infancy of improvement; but yet possesses great wealth, and is extremely populous; it yet carries on considerable manufactures, although it is no longer the great mart for commerce that it was 2 or 300 years ago. Its fortified towns, population, and canals sufficiently prove what it has heretofore been; and it were to be wished that its inha-



bitants, who have made a bold attempt to obtain liberty, were less under the influence of bigotry and superstition, for that alone prevented success.

The cities of Flanders are no longer in the flourishing state in which they were some centuries past. The canals, which were then numerous, kept in good order, and filled with vessels loaded with merchandise from every part of the then known world, are now entirely neglected and out of repair. Holland on one side, and France on the other, have not only encroached on their territories, but destroyed their trade. The city of Amsterdam rose to opulence on their decline.

So early as the twelfth century the spacious forests of Flanders were cut down, and the soil was laid open to the rays of the sun. Large canals were cut for inland navigation, which, while they drained the land, opened a communication for the inland commerce of the country. The river Scheldt was compelled to yield up fruitful fields which had long been overflowed, and was restrained within its channel by two prodigious dykes.

A spacious canal, a work of the sixteenth century, extends from Brussels (one of the residences of the Dukes of Brabant and Burgundy) to the Scheldt, which, although not open to vessels of these provinces where it enters the sea, yet opens a communication with Holland, and by the canals of Flanders, with the ocean. By this canal the city still carries on some trade or traffic, and we find at a distance from the ocean, and where there is no navigable river, a port filled with vessels of every kind adapted to all the purposes of trade and pleasure.

On the northern banks of the Scheldt, in the county of Wass, below Ghent, the Prince of Parma, during the memorable siege of Aptwerp, cut a canal which still remains.

The Flemish cities, situated in fertile plains, by the sides of rivers and navigable canals, were advantageously placed for maintaining those multitudes of inhabitants which they formerly contained, and the advancement of that commerce for which they were so distinguished. The free fairs, the origin of which is very ancient, and of which, though they are now of less utility, the remains are still to be found here, are supposed to have been first established in this country.

The canals of Holland are generally sixty feet wide and six deep, and are kept cleansed; the mud, as manure, is very profitable; the canals are generally levels, of course locks are not wanted. From Rotterdam to Delft, the Hague, and Leyden, the canal is quite level, but is sometimes affected by strong winds. For the most part the canals are elevated above the fields or the country, to enable them to carry off the water, which in winter inundates the land. To drain the water from Delftland, a province not more than sixty miles long, they employ 200 wind-mills in spring time to raise it into the canals. All the canals of Holland are bordered with dams, or banks of immense thickness, and on these depends the security of the country from inundation; of course it is of great moment to keep them in the best repair; to effect which there is established a kind of militia, and in every village is a magazine of proper stores and men, whose business it is to convey stones and rubbish in carts to any damaged place.

When a certain bell rings, or the waters are at a fixed height, every man repairs to his post. To every house or family there is assigned a certain part of the bank, in which they are to assist in the repairs. When a breach is apprehended they cover the banks all over with cloth and stones.

## SECTION VI.

*Abbreviated Account of the Canals of France and Spain, with a particular Description of the Canal of Languedoc.*

FRANCE furnishes us with numerous instances of industry and ingenuity, exerted in the construction of canals for inland navigation.

The first that history gives an account of in this country was that projected by Lucius Verus, who commanded the Roman army in Gaul, under the Emperor Nero, to join the Moselle and Rhine.

The canal of Briare, called also the canal of Burgundy, was begun under Henry IV. and finished in the reign of Louis XIII. It forms a communication between the Loire and the Seine, and consequently to Paris; it begins from the Loire at the town of Briare, passing to Montargis, where it takes the name of the canal of Montargis; just above which town it joins the canal of Orleans, and then proceeds on in one canal to Chau, Landau, Nemours, and Moret, and falls into the Seine near Fontainebleau; it is of the greatest utility to all this part of France, and even to Burgundy. This canal has forty-two locks and sluices, and by it Paris is supplied with corn, flour, and provisions, as well as the other productions of several provinces, such as Provence oils, dried fruits, hard-ware, muscadel wines, paper, and other merchandise; and in return the cloths, stuffs,

camblets, &c. of Abbeville, Amiens, Rheims, Sedan, and Lisle are also sent by this communication to the southern parts of France.

The canal of Orleans, which joins the above canal at Montargis, was begun in 1675, to effect a communication between the Seine and the Loire, near to the city of Orleans. It is much shorter than the canal of Briare, and has twenty locks and sluices; by this canal the inhabitants perform, in their *bateaux-coches*, a voyage to the neighbouring towns, and even to the city of Paris itself. These vehicles set out at stated times and places, for the conveyance of goods and passengers, which are transported a long distance at a small expense, and are covered over with canvas or tarpaulin.

The canal of Bourbon has been but lately undertaken; it is intended to join, by this canal, the river Oise to go to Paris; to prevent, as far as possible, a scarcity in that city.

The junction of the river Somme with the Oise, by means of a canal which is called the canal of Picardy, affords a ready conveyance to Paris for the grain of Picardy, the sea coal, wood, butter, copper, and spices from the northern provinces of the kingdom, and from Holland. This canal begins at St. Quintin, and is cut to near the town of Ham, on the river Somme, whence it crosses the country into the river Oise, near to Lafere, from whence vessels proceed down that river to Chauny, where the river is navigable into the Seine, and so to Paris, and by Rouen to the sea.

From the town of Landau a canal is cut into the Rhine, near the city of Spires, which is called the canal of Landau.

I come next to describe the canal of Languedoc, or, as it is called also, the canal of the Two Seas, which forms a junction between the ocean and the Mediterranean, and was first projected under Francis I. but begun and finished under Louis XIV. It does honour to the able minister Colbert, and to Riquet the engineer, who conducted the work.

This amazing undertaking was begun in 1666, and finished in 1681; it has answered every expectation formed of it, and also established a ready communication between the two fertile provinces, Guienne and Languedoc. This canal reaches from Narbonne to Thoulouse; it receives several little rivers as feeders in the way, and is provided, at proper intervals, with 114 locks and sluices. In some places it is conveyed by aqueducts over bridges of incredible height and strength, which, under them, give passage to other rivers.

What appeared most extraordinary at that time was, that near the town of Beziers it was conveyed under a mountain by a tunnel (a method which is now common) 720 feet in length, cut into a lofty arcade, for the most part lined with freestone, excepting towards the ends, where it is only hewn through the rock, which is of a sulphurous substance. The expense of this work was 13,000,000 of livres, about 540,000 pounds sterling, of which the king contributed 7,000,000, and the province of Languedoc the rest.

A concise description of this great work, the wonder of Europe, cannot be unacceptable, as by it modern engineers and projectors of inland navigations may be encouraged to encounter all difficulties that may oppose their patriotic labours.

This canal begins at Cette, in the bay of Languedoc, and passes through lake Thau to the town of Agde, where is a round canal or bason, with three openings and three different depths of water meeting there, and the gates or locks are of such ingenious construction that the vessels may pass through by opening either of them, which the master pleases. A contrivance which excited admiration in the great Vauban himself.

Not far from Beziers, and beyond the tunnel already mentioned, are eight locks, which form a grand and regular cascade 960 feet long, and by which the vessels cross the river Orb, and, continuing their voyage on the canal, pass the towns of Beuers, Argeno, Tresbes, Orbiell, Alzenne, Villepinte, into a large bason near to Castlenaudury, which receives the river Laudet. At St. Ferriol, near the town of Reuel, Mr. Riquet constructed a reservoir to supply the canal, containing 595 acres of water, which is first embanked, and then the embankment walled round with freestone between two rocky mountains. Under this dam runs a vaulted arch or sewer, reaching to the main wall, where three large cocks of cast brass are turned, opened or shut by iron bars; these cocks discharge the water through their mouths, which are as large as a man's body, into the aqueducts, and the bason at Narouse, which is the head of the navigation. The canal then descends from Narouse, by Avignenel, Montesquieu, and Baziege, into the river Garonne by three locks, a quarter of a mile below the city of Thoulouse, which it passes. Its breadth is 144 feet, towing paths included; it is six feet deep, and 64 French leagues long. It is here to be observed, that Narouse is the highest part of the

navigation, being 600 feet above the level of the two waters, from whence the ground has almost one continued descent on each side. On this spot, as before observed, Mr. Riquet made his bason or grand reservoir, and collected his waters; and hither he brought his current of water from the adjacent mountain, by an aqueduct five leagues in length, which contained near 6000 cubic inches, and this stream being distributed in the two canals last mentioned, forms altogether a body of 6,000,000 cubic feet of water.

When a barge or other vessel in its passage from Narbonne, after it has passed through the canal of the plain, arrives at the foot of one of these locks, the gates are instantly opened, and the water, so hemmed in, rushes forth with great violence, and mixing with that in the canal, forms a level; the vessel then sails into the lock, and the gates are shut again; the water then descends from the upper lock till full, seldom less than seven feet or more than twelve; the vessel again rises with it till on a level with the water in the next lock, by which means a vessel coming from Narbonne may pass, without any obstruction, out of the first lock into the second, or one coming from Thoulouse may be introduced out of the second lock into the first, the gates of the second lock being shut. The vessel in the same manner mounts into the third, and thus ascends from lock to lock till it comes to the top of distribution, and is by the same manner conveyed down to Thoulouse. To preserve the level, they have frequently turned and winded the canal round hills and rising grounds, and fortified it with an immense number of piles where the earth was likely to give



way. This canal is conveyed by water bridges and stone arches over valleys; hills and mountains have been levelled, while through others a passage has been cut and arched over, large enough for loaded vessels to pass under, with lights and air holes at proper distances.

Above 12,000,000 of cubic feet of earth, and more than 30,000 cubic feet of solid rock, have been removed to excavate its bed; it has on it 114 locks; sixteen prodigious large mounds have been raised to divert the course of useless waters, and twenty-four large spacious drains have been made to empty it when in danger of being too full. On a moderate computation there are above 240,000 cubic feet of stone-work in these erections, including a projection into the sea of 200 fathoms, and a pier of 5000 fathoms more, which secures the port of Cette, and renders it a very commodious harbour, the advantage of which is the greater, as the coast of Languedoc has no havens whatever, and is very dangerous.

The expence of this astonishing work was nothing in comparison with its wonderful utility.

Notwithstanding France abounds with canals, which intersect the country and join not only rivers but seas to each other, to the great improvement of the internal parts of the kingdom, and the encouragement of the husbandman and manufacturer, who thus find a cheap, easy, and ready conveyance for their produce to a market, and the metropolis; yet have we seen her, immediately on the conclusion of the American war, after the very active part she had taken in it, turning her attention to the advantages which Holland derives from her inland commerce: she is now imitating her example, and, at a

most enormous expence, actually cutting three canals or branches of great length to join the most navigable rivers for the improvement of trade and manufactures. On reduction of the army and navy in 1782, these canals were immediately begun, to give employment to the disbanded soldiers and seamen, that those useful members of society might not be forced to emigrate to foreign countries, languish in idleness, or starve in prisons ; or what is worse, through want and necessity, perhaps, come to an untimely end.

It would fill a volume to particularize the canals in France ; I, therefore, shall only just mention them as briefly as possible, that those who are curious, and have a map of that country before them, may observe with what labour and expence they have already promoted trade and commerce, by intersecting the country with canals.

The first of the above mentioned three canals will extend from Chalon-sur-Saone to the town of Digoin on the Loire, being 21 leagues, and form a junction with the river Saone, and the Rhone with the Loire. It is to be called the canal of Dehune.

The course of the second canal will be from St. Jean-de-l'Aune to the village of Roch, between St. Florentin and Joigny, a space of fifty-two leagues. It is to be called the canal of Burgundy, and will open a communication between the Saone, the Rhine, the Yonne, and the Seine.

The third canal will begin at the village of St. Symphorin, on the Saone, a little above St. Jean-de-l'Aune on the opposite shore, to the town of Dole, on the river Doubs, and passing the city of Besançon, will be continued below Strasburg, and form a junc-

tion of the Saone with the Rhone, and the Ill with the Rhine. A great part of this canal is finished, and is called the canal of Neuf-brissac, and falls into the river Ill. All these three great undertakings will be soon completed.

By these navigable canals there will be an easy, cheap, safe, and certain conveyance of goods from Marseilles, the Mediterranean, Italy, and Switzerland, to the bay of Biscay and the Ocean, and also to Holland and Germany, as well as to Flanders, and all the Austrian Netherlands; and during any future war with England, France will be able to supply, by them, her dock yards at Marseilles and Toulon, as also her grand arsenal and dock-yards at Brest and Rochfort, with all sorts of stores and commodities from the Baltic, without hazarding a voyage by sea; whereas they are now obliged to be brought from the Baltic down the English Channel to Brest, and through the straits of Gibraltar to Toulon, at the utmost risk of being captured by our ships of war and privateers, or they must go north about, which is a long and dangerous voyage.

Since the canal of Languedoc has proved of such advantage to the town of Cette and the adjacent country, other places have been induced to copy the example. From Cette another canal has been made, called the canal of Grave, which goes into the lake Mauguais near the city of Montpellier; and another canal out of the said lake to the town of Lunel, called the canal of Lunel.

There is another canal cutting out of the bay of Languedoc, through two small lakes, to the town of Beaucaire on the Rhone.

There is also another canal out of this canal, which proceeds to the village of Guveral, into the river Little Rhone.

Another from the town of Tarascon, on the Rhone, to the town of Arles on the same river, and down into the lake which falls into the bay near the mouth of the Rhone. It is called the canal of Boue.

Two others proceed from this canal, one near the town of Arles, the other at the head of the aforesaid lake; the latter is called the canal of Crapone, and goes into the river Durance, near Mirandol.

There are three other canals out of this river, near the city of Avignon; one is called the canal of Crillon, another that of Real, and the third that of Boisgeline.

Another canal is cut out of the above near to Eyguieres, into the great lake Berre, near the village of Istres, and which passes by the village of Salon.

Another is cut out of the other side of the aforesaid lake to the village of Paillassent; these two canals being into and out of the same lake are called canal Little Crapone.

These canals are all in the southern parts of France. I shall now enumerate those in the northern part; and first begin with the canal from Dunkirk to Furnes, called the canal of Dunkirk. There is another canal from Dunkirk to Bergues called by the same name.

Another from Bergues to Furnes, called the canal of Furnes; another from Furnes to Nieuport, called the canal of Nieuport.

Another proceeds from Bergues, by the village of Colme, to St. Omer's, and is called the canal of Bergue; this canal is continued from St. Omer's into

the river Lys, at the town of Aire, and is called the canal of Aire.

Another, cut in the year 1681, begins just above the town of Calais, and is carried across the country into a river near to the town of Audriue, which runs down to Gravelines. These canals intersect the country, and are not only useful for navigation but for draining the low country, which otherwise would be a useless bog, and covered with water, whereas by these means it is rendered one of the most fruitful countries in Europe.

A canal communication by locks is made between the towns of Lens, Lisle, Douay, and the rivers Upper and Lower Deule, the Scarpe and the Scheldt. From the city of Lisle, the canal takes a course near La Bisse and Lens to Douay, and is called the canal of Lisle and Douay, from thence it returns and goes out of the Scarpe, passes near Marchienne, and joins the Scarpe again at the town of St. Amand, from which it returns back with a very acute angle three parts of the way to Douay, and parallel on the other side of the Scarpe, and is called the canal of Tritaire.

Many other parts of the kingdom have canals of communication. Three canals are cut out of the small river Bonne, near the city of Grenoble, and another is cut lower down that river, which goes out of the river Drac, and is called the canal of Merbeys.

A small canal is cut out of the river Pau, near to the city of Pau, and is called the canal of Lester.

Another is cut out of the river Adour, near the village of Barcelonne, and goes to the town of Adour.

There is a canal cut out of the bay of Rochelle, to the town of Luçon, and near the same place the course of another canal is marked out from the mouth of the river Saigre, into the river Claine, near the city of Poitiers; this, when finished, is to be called the canal of Poitou.

The canal of Monsieur is cut out of the Loire at Chalonne, and passes by Layon Thouarce to Martigne. Another is cut out of the fork of that river at Mayenne, near the town of Angiers, and proceeds to the town of Auchion.

A short canal is cut out of the bay opposite the island of Bellisle to the town of Vannes.

These canals already finished, measure in length 858,000 toises, being 1,939 English miles.

Besides the already mentioned canals, which are finished, many others are projected in order to find employment for the soldiery. I shall here enumerate some of them which have come within my own observation.

From the city of Valenciennes a canal is marked out to pass by Quesnoy, into the river Sambre, near the town of Berlarmon, to be called the canal of Quesnoy.

From the village of Hennecourt, a canal is marked out near Cambray on the river Scheldt, to join the canal before mentioned at St. Quentin, called the canal of Picardy. This is intended to go from St. Quentin to Sissy on the Oise, and to be called the canal of Sauterin. This canal will join the Scheldt with the Oise.

Another canal is marked out higher up the Oise at the town of Guise, to join it to the Sambre at Ferney near the town of Landrecy.

Another from the Oise, below the canal of Picardy, at Chauny, to go to Laon, and return with a sharp angle into the river Vette at Onisy, is to be called the canal of Laon.

From the river Somme, near the city of Amiens, a canal is marked out to pass by Corbie, Bray, and Peronne, to Ham; and join the canal of Picardy near the last town, which consequently joins the Somme with the Oise.

Another is marked out from the Oise at the village of Criel, below Compiègne, to the town of Bevois, and to be called the canal of Bevois.

Four are marked out near the city of Paris; one from the Oise, at the Isle Adam, to cut into the elbow of the Seine at St. Dennis, and then out of the river straight to Paris; another is marked out from the Seine across the country into the river Mome at Gournay; a third is marked out from an elbow of the Seine above St. Dennis to Paris, and the fourth is marked out from Versailles into the Seine at the elbow at Sevres near to Paris.

A canal is marked out to join the Meuse at the village of Pagny, with the Moselle at the town of Toul.

A canal is marked out at Cosney on the Loire, to join the Yonne at the village of Swai, to go down that river to the Seine, to be called the canal of Cosney.

A canal is marked out from the little river Love, at the village of Lignon, to join the canal of Burgundy at Dijon.

A canal is marked out from the Rhone at Geissial, to fall into the lake of Geneva at Versoix, to be called the canal of Versoix.

A canal is marked out from the Loire at the town of Saumur to Moncontour, to be called the canal of Dessechement.

A very large and long canal is marked out from the bay near the city of Marseilles, to pass by Gardane, and near the city of Aix, to the villages of Foutouble and Lambeste, and to return with an acute angle into the river Durance, near the fork where the river Verdon goes out of that river; this is to be called the canal of Provence. A small canal is already finished, cut out of the Durance to the small town of Pertuis; it is called the canal of Durance.

A canal is marked out of the river Ter, in the same bay, and is intended to pass the city of Perpignan to the village of Millas, and another is marked out from the city of Perpignan, into lake Nazaire at the village Salcos.

If we now pass to the other side of the kingdom, we shall find a canal marked out from the Garonne at the village of Instres, into the river Leyre at Bellin, which is to be called the canal of Autre.

Another out of the Garonne at the city of Bourdeaux, into a lake called Bassin-de-Arcachon, and to proceed from one corner of it at the village of La Tête-de-Bouc, into the sea, to be called the canal of Bourdeaux.

Several others are marked out and projected, too tedious and perhaps uninteresting to mention; we may however observe, from the enumeration already given, with what care and assiduity the French nation are improving every internal part of their kingdom by canals cut from one river into another, and even into the Ocean and Mediterranean.

The lengths of these different canals added toge-



ther make 450,000 toises, or 545 English miles ; an amazing extent of country to improve by inland navigation.

I cannot omit to mention before I leave the subject of France, another magnificent work of Louis XIV. as if his grand canal were not enough to immortalize his name. I mean the famous aqueduct that he built near Maintenon, for carrying the river Bure to Versailles, from one mountain to another, across a valley which contains 240 arcades, and is 7,000 toises, or nearly eight and half English miles long, and raised to such an elevation that it certainly is altogether the greatest piece of modern architecture in the world.

1798. I have the highest pleasure to inform my countrymen, that a friend of Mr. Fulton's has just informed me that his small canal system, and his double inclined planes, have converted all the French engineers to his plan, and that he has actually just received a patent for 15 years for his invention, and the first piece of six leagues is just begun at Dreux, 60 miles from Paris. I have not the pleasure to know Mr. Fulton, but most heartily congratulate my countryman, and wish him the greatest success.

1802. Peace begins to diffuse new vigour into the minds of the trading part of the French nation. It is now in agitation to join the Rhone to the Rhine and lake of Geneva, for the purpose of opening a communication between Marseilles and Amsterdam. This canal will unite Basle and Frankfort ; the Meurthe, the Meuse, perhaps, and the Rhine are also to be joined. Bonaparte is indefatigably employed in finding useful employment for the troops, for as he hates idleness himself, he cannot bear to

see it in others, and he well knows it is the mother of mischief and insurrection.

July 1802. The French government are preparing to open canals in the Netherlands to employ the soldiery, and the mercantile interests of France are looking forward with the greatest anxiety to a commercial treaty with England. The impolicy of the prohibiting acts, from which France has suffered so much, is now generally admitted; and although Nantes, Bourdeaux, &c. in their petitions are anticipating their ruin, they all look up for relief and extension of trade to the wisdom and care of the First Consul, whose unwearied application to promote business and trade in every part of the republic is well known to every individual.

The First Consul, ever ready to encourage undertakings useful to the people, considering that all the water used at Paris is brought by water carriers, and in case of fire inevitable destruction and great loss must ensue, has given orders for a survey to the little river Buzeg or Bureg, in order to its being brought to Paris in the same manner as the New River is brought to London, and which was begun on the 22d September, 1802, it is intended to be laid into the streets and houses by pipes, fire plugs, and engines, to clean the streets as well as to accommodate the houses.

### SPAIN.

Spain is a vast body without a substance, which has greater riches than strength. The mines of Mexico and Potosi furnish that kingdom with means to purchase every thing except liberty; but bigotry and superstition, together with the Inquisition, pre-

vent the subjects of other countries from emigrating to it, and population is far from being encouraged. The pride of the Spaniards will not permit them to cultivate their lands, which are some of the finest in Europe, nor to apply themselves to commerce; and notwithstanding their riches, their country is barren, and the body of the people poor.

History informs us that it has frequently been proposed in Spain, to cut a canal through the isthmus of Darien from Panama to Nombre-de-Dios, to effect a passage between the Atlantic and South Seas, and thus open a straight passage to China and the East Indies; but the project appears to have been considered as chimerical, and treated with ridicule. It cannot indeed be supposed that the Spaniards would neglect to furnish their own country with canals, of which it is really in want, and yet wish to improve, by means of such works, a colony, and that a barren mountainous country, at 3,000 miles distance, and principally for the use of others.

Spain however has attempted something in the way of canals to improve the internal part of the country; but very much is wanted to complete them and to render them useful and profitable; though in any other country in Europe (Turkey and Portugal excepted) similar undertakings would very soon have been brought to perfection.

In 1785 the famous canal of Arragon began to justify the hopes entertained of it; since the reign of Charles V. some small vessels from Tudela arrived at Saragossa, where they were received with the greatest demonstrations of joy.

Don Ramon-Pignatelli did not think he derogated from the high dignity of an ecclesiastic, nor from

that of his illustrious birth, in devoting his studies to the service of his country; he presides over this undertaking, which, when accomplished, will open a new conveyance to the productions of Arragon, one of the provinces of Spain the most favoured by nature, and yet one of the least productive relatively to its extent. Two canals, that of Taustre, and the Imperial Canal, both of which begin at Navarre, and have the same depth of water, run in various windings through Arragon, and by turns recede from or approach the river Ebro, till they at length fall into it. These streams are the sources of industry to all the districts through which they flow, and render their fields fertile.

The province of Arragon is already planted with thousands of olive and other trees; the cities and towns which formerly were condemned to drought and scarcity, are now supplied with fish and water by these canals.

The rivers which, from the north of Navarre and Arragon, formerly emptied their waters into the Ebro, will contribute to the flourishing condition of the countries they have hitherto uselessly watered, as soon as the Ebro can receive the merchandise they bring. This undertaking has been effected by labours which deserve no less admiration than that excited by the wonders of the canal of Languedoc; for, besides the dykes, banks and sluices, with the larger and smaller bridges, which the two canals in their course rendered necessary, there has been constructed in the valley of Riozalon, an aqueduct 710 fathoms in length, and seventeen feet thick at the base in which the canal runs.

Another canal, in which very slow progress is

made, is cut out of the river Pisuerga, which runs from north to south, the waters of which it was intended should be made to supply the canal of Castile, projected and begun in the last reign. This project was afterwards almost abandoned, to the great prejudice of Old Castile, which only waits for such an opportunity for the sale and increase of its productions. The canal was to begin at Segovia, and follow the course of the river Eresma, which falls into the river Duero, to be continued as far north as Reynosa, receiving from the little rivers in its passage the tribute of their waters. Reynosa is only twenty leagues from St. Ander, a sea port where all the merchandise exported from Old Castile is shipped; a road (which will be destroyed before the canal is finished) has been made in order to facilitate a communication by land.

This undertaking, once regarded as the wild projects of the queen, will, in all probability, at a distant period, be accomplished, provided Spain has the wisdom not to engage herself in wars.

This canal begins at Segovia, sixteen leagues north of Madrid, and is separated from the southern canal by the chain of mountains which we passed at Guadarama.

From Segovia, quitting the Eresma, it crosses the Pisuerga, near Valladolid, at the junction of that river with the Duero; then leaving Palencia, with the Carion to the right, till it has crossed that river below Herrera, twelve leagues from Reynosa, receiving water from that river in its course, it arrives at Golmin; from thence, in less than a quarter of a league, to Reynosa, there is a fall of 1000 Spanish feet.

At Reynosa is the communication with the canal of Arragon, which unites the Mediterranean to the bay of Biscay; and from Reynosa to the Suanzes, which is three leagues, there is a fall of 3000 feet.

Above Palencia is a branch going westward through Beceril-de-Campos, Rio-Seco, and Benevento, to Zemora, making this canal of Castile in its whole extent 140 leagues.

They have already completed twenty leagues of it from Reynosa to Rio-Seco; which, with twenty-four locks, three bridges for aqueducts, and one league and half open cast through a high mountain, has cost thirty-eight millions of reals, or 380,000l. sterling, and this, supposing the twenty leagues equal to eighty-eight miles, is 4318l. per mile. For work executed in so complete a manner this sum is certainly not extravagant.

To expedite this arduous undertaking they employ 2000 soldiers, and 2000 peasants.

The soldiers receive three reals a day, besides their pay, when they work by the day; but they generally work task-work.

To regulate the prices they have three tables: 1st, for the quality; 2nd, the depth; 3rd, the distance; all founded on experiments. The qualities are, first, sand; second, soft clay; third, hard clay; fourth, loose schist; fifth, hard schist and solid rock, of which they make three distinctions, viz. such as can be worked, first, with pick-axe and shovel; second, by wedges and sledges; third, by boring and blast; this last, again, is subject to distinctions.

The canal is fifty-six feet wide at top, twenty feet at bottom, and nine feet deep, and when perfected, which will be not much less than thirty years, there will be no comparison with it in any part of

the world, either in point of workmanship, extent, or utility\*.

Spain owes to the sovereigns of the house of Bourbon the few roads and canals she possesses. We have already mentioned the canal of Arragon and that of Castile; the canal of Murcia next claims our attention, the completion of which has been found impracticable; the subscribers, instead of the profit which their avidity grasped at, must content themselves with the interest the king pays them.

In the year 1784 the minister formed a project much more brilliant and useful than that which he was obliged to abandon. A canal was planned, which, beginning at the foot of the mountains of Guadarrama, near the Escorial, should proceed to join the Tagus, afterwards the Guadiana, and terminate at the Guadalquivir, above Anduxar; and which consequently will give new life and activity to the interior parts of Spain, the least populous and most barren of the kingdom. A Frenchman of abilities, Le Maur, gave in the plan, and was preparing to carry it into execution, but died soon after. The impulse, however, was given, the money subscribed, and the estimate made, and the undertaking is continued by the sons of Le Maur, who inherit from their father all his plans and a great portion of his talents.

In May, 1785, the bank made a proposal, the admission of which will find new employment of its funds, and add the encouragement of security; this was to undertake to complete the canal above mentioned. The bank offered to make the necessary advances for this great undertaking, upon the same conditions on which it received the contract for vic-

\* Townshend's Travels, 1792.

tualling and clothing the troops, and the proposal was accepted by government, who immediately employed Le Maur, nor did the unexpected death of that able engineer suspend the work, it being carried on by his sons, as before mentioned.

Another canal was begun under the administration of M. de Grimaldi, to join the river Manzanares to the Tagus; scarcely were three leagues of it finished when want of capital and of industry suspended the works. The only advantage derived from it is, the produce of a few mills; and this is absorbed in the repairs of bridges and sluices, and the salaries of the persons employed. But the activity now given to all branches of administration will soon have its effect on the canal of Manzanares; the mills upon it are already useful to the undertakings of the bank charged with victualling the army; and the canal itself will in a short time become a part of that which, as has been already observed, is to cross the interior parts of Spain.

In 1785, General O'Reilly, governor of Cadiz, employed M. Bournial, whom he sent for from France, to bring fresh water to Cadiz, from springs at the distance of eleven leagues; but on General O'Reilly's disgrace the scheme was abandoned, although M. Bournial had surveyed and taken the levels, and finished the plans; and, to engage the nation to carry it on, had, on opening the ground, found and traced the remains of an old canal or aqueduct, without doubt dug by the Romans for the same purpose.

The internal parts of Spain are as capable of receiving the improvements of inland navigation as any country in Europe, and there is no country in



the world to which they are more necessary. The great rivers Ebro, Guadalquivir, Guadiana, Tagus, Duero, and Minho, rise in the middle of the kingdom, and run into the Ocean and Mediterranean ; and there are besides many others of less note, from which navigable canals might be made to intersect the interior parts of the country, at a very reasonable expence, the profits of which undertakings would be immense, for it will scarcely be believed, that even in this enlightened age, the Spaniards carry the productions of the interior parts of the country, which chiefly consist of wine and oil, in large leather bottles, on the backs of mules and asses, from one province to another. Grain is also conveyed in the same manner to different parts of the country, which produce none, although the climate is perhaps the finest in the world.

An Englishman would scarcely be able to restrain his indignation at seeing the gifts of Providence so abused, when very little assistance from art is required to complete what nature has so abundantly lavished.

The author of this history was in treaty with Prince Masserano, when he was ambassador at the British court from Spain, to go with a number of workmen from England, if they could have obtained permission from government, to make common sewers through the city of Madrid, and pave it after the manner of London, which improvement it is in great want of, and also to survey the country, in order to improve it with canals ; but a war with Spain soon after succeeded, the Spaniards having joined the Americans, and acknowledged their independence, just as application was intended to be made

for the permission of the English government, and the scheme was rendered abortive.

The kingdom of Spain, according to Ustariz, contains about 7,500,000 inhabitants, and would be able to support twice that number, were it properly cultivated, its manufactures encouraged, and its mines worked. It contained, in the time of the Goths and Moors, near 30,000,000 of people. Inconsiderable too as the number of inhabitants now is, yet they are also very poor, although they live in a land capable of supporting many millions more in plenty, and which, besides its natural advantages, has immense sums of money poured in from America.

Savala, in his *Treatise Del Comercio de las Indas*, computes that from the year 1492, when America was first discovered, to 1731, above six thousand millions of pieces of eight, in registered gold and silver, have been imported into Spain, exclusive of far greater sums unregistered, and above 500,000 Spaniards have emigrated to that country in hopes and in search of riches, who have never returned, which has greatly assisted to decrease the population of old Spain. But as these remarks may appear somewhat foreign to my subject, I shall proceed, according to my plan first laid down, to prosecute my enquiries concerning the canals of England.

## SECTION VII.

*An abridged general Description of the Canals of England.—Canal of Caerdyke the most ancient.—Canal of Sandown—Castle Kent.—Canals in the great Levels and Fens.—The New River.—The Duke of Bridgewater's Canal, being the first modern Canal made in England.—Difficulties surmounted in the Execution of this Work.—Particulars of the Life of the ingenious Mr. Brindley, his Grace's Engineer employed in this great Work, &c. &c. &c.*

**ENGLAND**, in which all the arts and sciences, commerce, and agriculture especially flourish, is an island containing numerous rivers, rendered navigable by art, where not so by nature. The rivers Thames, Trent, Severn, and Mersey, extend far into the country; and almost divide the island into four parts; yet, though four of the principal parts of the kingdom, London, Bristol, Liverpool, and Hull, are commodiously situated on these great rivers, and incessantly crowded with innumerable vessels laden with the richest productions of the different countries of the world, none of these great commercial ports had, for a long time, any communication with each other except by a tedious and circuitous navigation, or a tiresome and expensive land carriage; and though we had for example Holland and France so near us, well furnished with

canals for inland navigation, executed and attended with the greatest advantage, because by them a sale was procured for a variety of productions of the internal parts of those countries, which were before useless, or consumed only in the place of their growth; yet neither government, nor any public spirited individual attempted any works of that nature in England.

To the insular situation of Great Britain, and its numerous large and navigable rivers, we may no doubt justly attribute the long neglect of canal navigation in this country. A private undertaking of this kind was at length begun by a noble Duke, during the continuance of an expensive but glorious war, in which conquest crowned, in the most signal manner, almost every effort of the British arms in every part of the globe.

Peace succeeding, a full tide of commerce, and its concomitant, wealth, poured into England from every quarter of the world; and new sources of trade and riches being opened, a general emulation was excited among our manufacturers to rival and surpass, if possible, those of other countries.

The success of the noble individual above mentioned, who planned and began the first canal for inland navigation in this country, by drawing a mine of wealth from the bowels of a mountain which had hitherto been totally useless and of no value, awakened a general ardour for similar improvements, among the land owners, farmers, merchants and manufacturers of the kingdom; and although there was not a Lewis XIV. nor a Colbert to encourage them, there wanted not engineers, equal to Riquet; and England, though late, began to rouse

from her lethargic slumber, and pour forth the riches which she possessed in her inland provinces; to effect which her navigable rivers alone, however numerous and large, were found to be inadequate.

In treating of the canals of England, Caerdyke, if it may be properly called a canal, ought perhaps first to be mentioned, as it is the most ancient; but whether it was intended for the purposes of inland navigation, it is impossible for me to determine, different authors having assigned to it different uses; but as it is cut from the river Nyne a little below Peterborough in Northamptonshire, into the river Witham three miles below Lincoln, there is great reason to suppose it was intended to join those two rivers. It was probably a work of the Romans, and was 40 miles in length, though now almost filled up, and must have been very deep, some authors suppose it to have been cut by the Danes. Moreton will have it to be made under the emperor Domitian, as urns and medals have been dug up near it, which seem to confirm this opinion.

The next that appears to attract our attention is the remains of a canal from Sandown Castle in Kent, into the sea. I will repeat it as mentioned by Smeaton in his treatise on Ramsgate harbour, it being short.

In the time of King Edward VI. (says he) it is said there was an attempt to make a harbour from Sandwich into the Downs, and that the evident traces of a canal, which are still subsisting in the level grounds between Sandwich and Sandown Castle, are the remains of that attempt. It is also said that commissioners were appointed by Queen Elizabeth in 1574 to take a survey of Sandwich haven,

and to give their opinion as to the making a better harbour near the old canal at Sandown Castle.

I might perhaps be thought remiss if I did not notice Kinderfly's and Badslade's reports and objections of the ancient and present state (1751) of the inland navigations on the great level of the Fens which extend nearly through six counties, viz. Lincoln, Norfolk, Suffolk, Cambridge, Huntingdon and Northampton, being 60 miles in length, and 40 miles in breadth, containing about 600,000 acres.

The canal for supplying London with water, commonly called the *New River*, next claims our attention. This was projected and begun by Mr. (afterwards Sir Hugh) Middleton in the year 1608, and finished in five years. This canal begins near Ware in Hertfordshire, and takes a course of 60 miles before it reaches the grand cistern or reservoir at Islington, which supplies the multitude of pipes that convey the water into the city and parts adjacent. In some places it is 30 feet deep; and near Hornsey it was formerly conveyed over a valley between two hills, by means of a wooden trough supported by wooden props, and 23 feet in height; but of late years the course of the river has been changed and embanked. In other places, meandering round hillocks and rising grounds, it is confined on one side by the solid hill, and on the other by banks very large and thick, or large mounds.

The different rivers which have been made navigable by art, above the tide-ways, do not come within my plan. The first modern canal therefore that claims attention, as being the first public work of the kind executed in England, although completed at the expence of a private individual, is that

made by his Grace the Duke of Bridgewater, in whose praise it would be unpardonable to be silent, who, at an age too often spent in dissipation by our young nobility, applied his attention to useful objects, and had the spirit to hazard so great a part of his fortune in an undertaking worthy the pursuits of a prince, which, however, has ultimately proved highly profitable to himself and beneficial to his country. When the influence of exalted rank and large possessions are thus nobly and usefully exerted, they confer additional lustre on the possessors, who then justly merit being ranked among the first citizens of their country.

His Grace had the honour as well as pleasure of having first introduced inland navigation into this kingdom; the utility of which is so sensibly known and felt, that it is at length, to the profit and happiness of this country, encouraged by the nobility and land owners in most of the interior parts of the country. It would also be unpardonable to withhold the praise so justly due to the penetration of this illustrious nobleman, for having called forth the hidden talents of a Brindley; talents, which, but for his Grace, would have been lost to this country.

In the years 1758 and 1759, his Grace the Duke of Bridgewater, after obtaining two acts of Parliament for that purpose, projected, began, and executed, under the direction of his engineer, Mr. Brindley, his first canal, which was designed for conveying coals from a mine, or more properly a mountain, on his Grace's estate, to Manchester, but has since been applied to many other useful purposes of inland navigation. This canal begins at a place called Worsley Mill, seven computed miles from Man-

chester, where the Duke has cut a bason capable of holding not only all his boats, but a great body of water, which serves as a reservoir, or head of his navigation. The canal runs through a hill, by a subterraneous passage, big enough for the admission of long flat bottomed boats, which are towed by hand-rails on each side, near three quarters of a mile under ground to the coal works. There the passage divides into two channels, one of which goes 500 yards to the right, and the other as many to the left, and both may be continued at pleasure.

The passage is in some places cut out of solid rock, and in others arched over with brick. Air funnels, some of which are thirty-seven yards perpendicular, are cut at certain distances through the rock to the top of the hill; the arch at the entrance is six feet wide, and five feet high above the surface of the water. It widens within, so that in proper places the boats can pass each other, and at the pit is ten feet wide. The coals are brought to this canal in little low waggons that hold a ton each, and, as the work is on the descent, are very easily pulled along by a man on a railway, to a stage over the canal, and then shot into one of the boats, each of which holds eight tons. They then, by means of the rails, are drawn out by one man, into the bason, at the mouth, (a boy of seventeen years of age has worked twenty-one of these boats at a time, which, at eight tons each, is 168 tons) then five or six of them are linked together, and drawn along the canal by one horse or two mules, on the banks or towing paths: it is there broad enough for the barges to go abreast; and in the course of nine miles (a circuit of two miles being made in seeking a level), the



canal reaches Manchester. The canal is carried over public roads by means of arches; and where not high enough for a carriage to go under, the ground is lowered with a gentle descent, and ascends on the other side. It is carried over the navigable river Irwell, and nearly forty feet above it, so that large vessels in full sail pass under the canal as under a large lofty bridge, whilst the Duke's barges are passing over them.

It may be proper here to describe the noble aqueduct which carries this canal over the river Irwell. This stupendous canal was begun at a place called Worsley Mill, as before observed, seven miles from Manchester, where, at the foot of a large mountain of coals, the Duke has cut a bason capable of containing many boats, and a great body of water, which is a reservoir and head to his navigation. At Barton bridge, three miles from the bason, begins this aqueduct, which, for upwards of 200 yards, conveys the canal across the river and along a valley, forty feet above the navigable river Irwell: there are also stops at each end that may occasionally be drawn up, and the whole intervening body of water let off, which is easily done, only by drawing a plug and discharging the water into the Irwell through a wooden tube. There are many of these stops or floodgates, so well constructed, that should any of the banks give way, and thereby occasion a current, they will rise by that motion, and prevent, as well the loss of water, as the damage that would otherwise happen by overflowing the country.

This bridge unites the Lancashire and Cheshire parts of the Duke's navigation; it is carried over the meadows on each side of the river Mersey; and

quite across Sale-Moor, at incredible labour and expence. Mr. Brindley caused trenches first to be made, and then placed deal balks in an upright position, from thirty to thirty-six feet long, backing and supporting them on the outside with other balks lengthways and in rows, and fastened together with screws, driving in some thousand of oak piles of different lengths, between them; and on the front side he threw the clay and earth well rammed together to form his navigable canal. After finishing in this manner about forty yards, he proceeded again as before, in a line where it was intended the canal should continue.

An ingenious method was used to fill up the bed of the canal to a proper level. Two long boats were fixed together within two feet of each other; between and over them was erected a trough large enough to contain eighteen tons of rubbish. The bottom of this trough was composed of a line of doors or flaps; which, upon drawing a pin, burst open and instantly dropped the burthen. The usefulness of this contrivance is evident, for, from a near spot, the trough was loaded, in a short time drawn to the place wanted, and in an instant its contents deposited.

The bridge for the aqueduct over the Irwell is built all of stone of great strength and thickness; every front stone has five square faces or beds, well jointed and cramped with iron run in with lead. There are three arches over the river Irwell, which, with the piers, are of the largest blocks of stone, and cramp as before; the centre arch is sixty-three feet wide and thirty-eight feet above the water in the Irwell, and will admit the largest barges that navigate that river to pass under with mast and

sails standing! At Stretford, three miles from hence, was the caisson, forty yards long and thirty-two broad.

At Combroke, three miles further, is a circular wear to raise the water of the canal to a proper height; the surplus flows over the nave of a circle, in the middle of the wear which is built of stone, into a well, and by a subterraneous tunnel is conveyed to its usual channel. There is also a machine to wash the slack which is worked by water.

In order to feed that end of the navigation near Manchester, Mr. Brindley raised, and as it were swallowed up the river Medlock, by a large beautiful wear composed of six segments of a circle, built of squared stone and bedded in terras, every stone cramp with iron and flushed in with melted lead; the whole circumference is 360 yards, with a circular nave of stone in the middle. The water, when more than sufficient to supply the navigation, flows over the nave, and down the well, as at Combroke; but in order to keep the bed dry, during the time the workmen were building this wear, he turned off a great part of the water by a cut through the rock, and invented an engine which he called a spoon, and which he worked at the end of a lever by a horse. When this spoon dips into the water, a kind of flap door made of leather, is pressed open, and admits the water till full, and on being weighed up the pressure of the water within closes the door, and as the lever rises it runs off by a channel cut within the spoon's handle.

From the wharf at this place the poor of Manchester fetch their coals in wheelbarrows, at three-pence halfpenny for a hundred weight of seven score.

which is not half the price they before paid for that necessary article. But Mr. Brindley, to remove the inconvenience of carrying them up Castle Hill, has cut a large tunnel through the centre of the hill, into which the barges are introduced; and by a crane that is worked by a box water-wheel of thirty feet diameter, and four feet four inches wide, they are landed close to the town. This branch of the canal to Manchester is ten miles, and has been executed on an average at 1000 guineas per mile.

At Langford-bridge the canal turns away to the right, and crossing the river Mersey, passes near Altringham, Dunham, Grapenhall, and Haulton, into the tide-way of the Mersey at Runcorn Gap, where the Duke's barges come into his canal from Liverpool at low water.

The ingenuity and contrivance displayed through the whole work was wonderful. The smiths' forges, the carpenters' and masons' workshops were covered barges, which floated on the canal, and followed the work as it went on, by which means there was no hindrance of business, and as the Duke had all the materials in his own possession, timber, stone, and lime for mortar, and coals from his own estate, all hard by, he has been at little expence besides labour. It must be observed that the Duke has made the refuse of one work serve for the construction of another; thus the stone that was dug up to make the bason for the boats, at the foot of the mountain, as well as others taken from out of the rock to make the tunnel, were hewn into the proper forms to build bridges over rivers, brooks, and highways, and the piers and arches to support the aqueduct. The clay, gravel, and earth taken up to preserve the level at

one place, are carried down the canal to raise the land in another, or reserved to make bricks for other uses.

Here grandeur, elegance, and economy are happily united. At first view it would seem that the work was intended to excite astonishment. But on a closer inspection there is to be found nothing unnecessary, and the whole has been finished at an expence no way adequate to the undertaking; in short, the work is truly admirable, and will be a standing monument of the public spirit and economy of the Duke of Bridgewater to the end of time.

Before the Duke began his canal, the price of water carriage, by the old navigation, on the Mersey and Irwell, from Liverpool to Manchester, was twelve shillings per ton, and from Warrington to Manchester ten shillings; land carriage was forty shillings per ton, and not less than 2000 tons were yearly carried on an average. Coals were retailed to the poor at Manchester at seven pence per hundred weight, and often dearer. The Duke, by his navigation from Liverpool to Manchester, carries for only six shillings per ton, in a shorter time, and as certain delivery as by land carriage, consequently one half is saved to the public of the old water carriage, and to the poor for coals, and almost six parts in seven of land carriage.

A short account of the acts of parliament which the Duke obtained for the purpose of making his canals will not, I think, be improper, adding a few observations, as I proceed, by way of explanation.

In the years 1758 and 1759 the Duke of Bridgewater obtained an act for enabling him to cut a navigable canal from Worsley to Salford, near Man-

chester, and to carry the same to or near Hollin Ferry in Lancashire.

Soon after the passing this act his Grace began his works, and made a navigable canal from Worsley Mill to the highway leading from Manchester to Warrington : it being then discovered that the navigation would be more beneficial both to himself and the public, if carried over the river Irwell near Barton-bridge to Manchester, his Grace applied again to parliament to vary the course of his canal accordingly, and to extend a side branch to Longford-bridge, near Stretford, and obtained an act for that purpose.

The making a canal over the river Irwell, and filling up the hollow ground on the north side of that river, appeared a most arduous undertaking; and by most persons who viewed it thought to be impracticable ; but his Grace being well supplied with all materials wanted from his own estate, has completed this as well as other difficult undertakings.

By the first act a rate or duty not exceeding half-a-crown a ton was granted to the Duke as a recompense for the making his navigation, and the second act varies the course of the canal and extends it, but makes no alteration with respect to tonnage.

The Duke, upon a further survey, and taking levels, found it practicable to extend his canal from Longford-bridge to Dunham, to fall into river Mersey, at or near a place called the Hempstones, below Bank-quay, so as to bring vessels into his canal at the lowest neap-tides ; and having obtained a third act for that purpose, undertakes it at his own expence, and without any additional tonnage.

“ If navigations are advantageous to a country,  
“ that advantage must increase in proportion to their

“ extent, and the intercourse and connections with  
“ the parts with which they communicate; and,  
“ allowing this to be a fact, there certainly cannot be  
“ a more interesting consideration, than the facili-  
“ tating the conveyance of goods and merchandise  
“ between the great trading towns of Manchester  
“ and Liverpool.”

The above navigation is more than twenty-nine miles in length; it falls ninety-five feet, and was finished in five years. The utility and profits of it were soon perceived by a trading discerning people, and a number of applications were immediately made to parliament for different acts, as was expected, to join the four great trading cities, London, Bristol, Liverpool, and Hull, by an inland navigation, with branches to different manufacturing towns, as I shall particularly relate hereafter.

It would be useless in this abridged work to give the three acts of parliament granted to the Duke, as those who particularly want to see them can always purchase them. I shall therefore proceed, but must beg excuse for a digression which I hope will be both pleasing and useful to the reader.

I cannot give a truer character of the Duke of Bridgewater, and that of his celebrated engineer, nor set forward the great utility of their wonderful undertaking in more lively colours, than by giving a literal extract from a treatise on that subject, written by a gentleman well known for his great abilities as a statesman, as well as his great knowledge of the mercantile world and landed interest\*. And if I should be deemed prolix, I hope to be excused, from

\* Richard Whitworth, Esq. afterwards Sir Richard, and then member for Stafford.

my desire as well to be useful as to please the reader, for such a theme can scarcely ever be exhausted, nor ought such a stupendous work to be treated merely as a common occurrence or undertaking.

This gentleman begins with—"Nor can I enough admire and commend that noble spirit and good sense with which his Grace the Duke of Bridgewater has so lately proved to the world that the advantages of inland navigation are only to be obtained by carrying and cutting level canals of dead water from one town to another, which admit not, nor are subject to, one half of the inconveniences which the late method of making rivers navigable, by pounding up the water by large and expensive locks, is of necessity exposed to from the force of the stream and floods. Nor can I help admiring the wonderful and great natural genius, of Mr. James Brindley, who planned the same, and perfected these canals, surmounting with his own genius and his Grace's money and spirit, things that might have been thought by 900 out of 1000 people almost insurmountable difficulties. The breadth of these canals is about eight yards wide, and four feet deep; they are chiefly made in a straight line over a flat country. His Grace's first attempt was in order to carry coals from his works to supply Manchester and other towns in Cheshire and Lancashire. The last act of parliament enabled his Grace to proceed to Altringham, in Cheshire, with which undertaking they are now in great forwardness (1766). They have now completed seventeen miles, at about 700 pounds per mile, exclusive of the expence of bridges, &c. The Duke has built a very handsome bridge, or aqueduct, over the Irwell, in order to convey his canal across that



river; it is near fifty feet high, and 500 yards long, with three arches; the main arch being sixty-three feet wide. There is a road on each side of the canal over the bridge for horses to draw the vessels along; and indeed it is no unpleasant sight to see one vessel fifty feet higher than another, sailing over the bridge, at the same time when another is sailing fifty feet below it. There is one place where the canal goes over the highway from Manchester to Ecclestone. But what is most ingenious, is the invention of floodgates that are under water and across the canal; they lie almost horizontally, a small matter inclining to each other, and at a quarter of a mile distance, in order that, if any part of it should break its banks, the draught of water rushing towards the breach may draw up the two floodgates, by which means no more water will be lost out of the canal than is between the two floodgates; and this, upon stopping the breach, is restored by letting the floodgates down again. In short, the principle upon which the whole is formed is a fixed resolution to carry the level on through all difficulties, which plainly appears in that great and amazing bank of earth which has been carried across Stretford meadows, which is 900 yards long, seventeen feet high, and 112 feet in breadth at bottom. Upon the top of this they have carried the canal eight yards broad, four feet deep, and one towing path on each side ten feet broad. After this difficulty, I shall think nothing too much for money to do, joined with a tolerable judgment and some ingenuity. I cannot tell what these canals, &c. have cost the Duke; and I suppose the world will never know, but by report; one may compute 100,000 pounds or upwards; which is not only the greatest

undertaking that ever was executed by any one subject in this nation ; but I may add of all the world. I have now shewn, I hope, that an inland navigation may be made by cutting canals through lands, much easier and better than pounding up the rapid current of a river by locks."

Yet notwithstanding the Duke's undertaking was accomplished to the satisfaction of every beholder, and the difference in favour of canal navigation, contrasted to that of a river, was never more exemplified, nor appeared to more full or striking advantage than at Barton-bridge, in Lancashire, where one may see, at the same time, seven or eight stout fellows labouring like slaves, to drag a boat slowly up the river Irwell, when one horse or mule, or two men at most draw five or six of the Duke's barges linked together, at a great rate, upon the canal, which is carried over at this place by his magnificent aqueduct ; and notwithstanding the last-mentioned gentleman's treatise was published in 1766, which convinced (as he says) not only 900 out of 1000, but 999 out of 1000, that canal navigation by still water was the best, and experience tells us, the most useful ; yet, I say, we find in 1768 an ingenious and sensible advocate for river navigation ; even after Mr. Smeaton had surveyed and delivered in his estimates to join the Forth and Clyde, in Scotland, and whose objections I shall mention hereafter.

I cannot take leave of the Duke of Bridgewater with any propriety, without mentioning a few of those leading particulars which proved the great depth of his Grace's understanding and the well placed confidence he reposed in Mr. Brindley, who will be admired by succeeding generations. For it must be

observed, the Duke had no facts performed, no demonstrations to revert to, nor any copy to follow to set himself right ; but, actuated by his own discernment, and guided by the genius of his faithful Brindley, he consented to become the original, and set an illustrious example for others to follow. Mr. Brindley, I must beg leave to mention once more, who was his Grace's principal engineer, and one of those geniuses which nature sometimes rears by her own force, and brings to maturity without the necessity of cultivation. His whole plan was admirable, and so well concerted that he was never at loss ; for if any difficulty arose, he removed it with a facility that appeared like inspiration, and that without the least appearance of vanity or ostentation ; for being without education, he too well knew his inferiority in that point, and having no sinister ends to gratify, no contracted notions or ideas, nor jealousy of rivals, he concealed not his methods of proceeding, nor asked or solicited patents for the sole use of machines which he invented and exposed to public view. His method of draining coal pits by a fire-engine, constructed at an expense of only 150 pounds, which none knew how to make before for less than 500 pounds, is a great improvement to the public, who are indebted to him for the invention ; nor must I omit a mill near the mouth of the subterraneous passage, and which, though an overshot mill, is so contrived as to work three pair of grinding stones for corn, a boulting mill, and a machine for sifting sand and making mortar, by a large stone laid horizontally, and turned by a cog wheel underneath it ; this stone, on which the mortar is laid, turns, in its course, two other stones that are placed upon it

obliquely, and by their weight and friction work the mortar underneath, which is tempered and taken off by a man employed for that purpose.

He also has invented portable cranes of uncommon construction, to draw stones out of the quarries by callipers. His water bellows at the mouth of the cavern equally deserve notice. These consist of only the body of a hollow tree, standing upright, upon which a wooden bason is fixed in the form of a funnel, which receives a current of water from a higher ground ; this water falls into the cylinder, or hollow tree, issues out of the bottom of it, and carries a quantity of air, which is received into tin pipes and forced into the inmost recesses of the coal-pits, where it rarefies the body of thick air, which would otherwise prevent the workmen from existing on the spot where the coals are dug. Numerous other machines and contrivances have been invented by Mr. Brindley, and all upon the most plain and simple construction, all tending to save great expense and trouble. And here permit me to insert some short particulars of the life of this extraordinary mechanic and father of English inland navigation, extracted from the *Biographia Britannica*.

Mr. James Brindley, a man of uncommon genius for mechanical inventions, and who particularly excelled in planning and conducting inland navigation, was born at Tunsted, in the parish of Wormhill, and county of Derby, in the year 1716. His parents dissipated away the little freehold they possessed, and young Brindley, was totally neglected in education ; and in his earliest part of life contributed to their support. At seventeen years of age he bound himself apprentice to one Bennet, a mill-

wright, near Macclesfield, in Cheshire, and soon became very expert in his business; he quickly discovered an attachment to the mechanic arts in general; in the early part of his apprenticeship he was often left whole weeks together by his master, without any previous instructions, who was frequently astonished at the improvements he often introduced into the mill-wright business, and the millers, wherever he was employed, always chose him in preference to any other man, even his master.

I must here mention, to his honour, a singular instance of our young mechanic's active and earnest attention to the improvement of mill-work. His master having been employed to build an engine paper mill, which was the first of the kind ever attempted in those parts, went to see one of them at work to copy after. But notwithstanding this, when he had begun to build the mill, and prepare the wheels, the people of the neighbourhood were informed by a mill-wright, who travelled that road, that Mr. Bennet was throwing his employers' money away, and could not complete what he had undertaken. Young Brindley hearing of this report, was resolved to see the mill intended to be copied; accordingly, without mentioning his intentions, he set out on a Saturday evening, after working all day, travelled fifty miles on foot, took a view of the mill, and returned back in time for his work on Monday morning, informed Mr. Bennet wherein he was deficient, and completed the engine to the satisfaction of the proprietors. Besides this, he made considerable improvements in the press-paper.

Mr. Brindley, when out of his time, engaged in the mill business on his own account, and by many

useful inventions and contrivances advanced it to a higher degree of perfection than it ever before attained. By degrees his fame began to spread wide in the country, and his genius was no longer confined to mill-work only. In the year 1752 he erected a very extraordinary water engine at Clifton, in Lancashire, for the purpose of draining coal-mines, which before were worked at an enormous expense. The water for the use of this engine was brought out of the river Irwell, by a subterraneous tunnel 600 yards in length, carried through a rock, and the wheel was fixed thirty feet below the surface of the ground. Mr. Brindley's superior skill in mechanics being now well known in that part of the kingdom, his reputation reached the metropolis, and he was employed by N. Patterson, Esq. of London, and some other gentlemen, in 1755, to execute the larger wheels of a new silk mill at Congleton, in Cheshire. The execution of the smaller wheels, and of the more complex part of the machinery was committed to another person, who had the superintendency of the whole, but who was not however equal to the undertaking, and confessed himself unable to complete it. The proprietors were greatly alarmed, and called in the assistance of Mr. Brindley, but still left the chief management to their former engineer, who refused to let him see the whole model, and affected to treat him as a common mechanic. Mr. Brindley felt his own superiority to the man who thus assumed consequence, and would not submit to such unworthy treatment, and he told the proprietors if they would let him know what was the effect they would wish to have produced, and would permit him to perform the business in his own way, he would engage to:

finish the mill to their satisfaction. This assurance, joined to the knowledge they had of his ability and integrity, induced them to intrust the completion of the mill solely to his care ; and he accomplished that very curious and very complex piece of machinery in a manner far superior to their expectation, by constructions of many new and useful improvements, particularly one for winding the silk upon the bobbins equally, and not in wreaths ; and another for stopping, in an instant, not only the whole of this extensive system throughout its various apartments, but any part of it individually. He invented likewise machines for making all the tooth and pinion wheels of different engines. These wheels had hitherto been made or cut by hand with great labour. But by means of Mr. Brindley's machines as much work could be performed in one day as before required fourteen. The potteries in Staffordshire were also much indebted to him for additions in their mills, for grinding flint stones with more facility. In the year 1756, Mr. Brindley undertook to erect a steam engine near Newcastle-under-Line, upon a new plan ; the boiler of it was made with brick and stone instead of iron, and the water was heated by fire flues of a peculiar construction, by which contrivances the consumption of fuel, necessary for the working a steam engine, was reduced one half. He introduced likewise into this engine cylinders of wood, made in the manner of coopers' ware, instead of iron ones, the former being not only cheaper, but more easily managed in the shafts ; he substituted wood, also, for iron in the chains which worked at the end of the beam. His inventive genius displayed itself in many other useful contrivances.

Mr. Brindley's attention to this part of mechanics was soon called off to an object of the highest national importance, namely, the projecting and executing of inland navigation, from whence the greatest advantages arise to trade and commerce. In this period of our great mechanic's life we shall see the powers given him by the God of nature displayed in the production of events, which, in any age less pregnant with admirable works of ingenuity than the present, would have constituted a national one. We shall see him triumphing over all suggestions of envy, or prejudice, though aided by the weight of established customs, and giving full scope to the operations of a strong and comprehensive mind, which was equal to the most arduous undertakings. This he did under the protection of a noble Duke, who had the discernment to single him out, and the steadiness and generosity to support him, against the opinions of those who treated Mr. Brindley's plans as chimeras, and laughed at his patron as an idle projector.

His Grace the Duke of Bridgewater, as has been observed before, hath at Worsley, seven miles from Manchester, a large estate that is rich in mines of coals, which hitherto had lain useless, because the expense of land carriage was too great to find a market for consumption. The Duke, wishing to work these mines, perceived the necessity of a canal from Worsley to Manchester; upon which occasion Mr. Brindley was consulted. Having surveyed the ground, he declared the scheme to be practicable, and an act for that purpose was obtained; the success of which is before described, and was the first of the kind ever attempted in England. The



principle laid down at the commencement of this business reflects as much honour on the noble undertaker as it does upon his engineer. It was resolved that the canal should be perfect in its kind, and that, in order to preserve the level of the water, it should be free from the usual construction of locks. But in accomplishing this end many difficulties were deemed insurmountable. It was necessary that the canal should be carried over rivers, and many large and deep valleys, where it was evident that such stupendous mounds of earth must be raised, as would scarcely, it was thought by numbers, be completed by the labours of ages; and above all, it was not known from what source so large a supply of water could be drawn, even on this improved plan, as would supply the navigation. But Mr. Brindley, with a strength of mind peculiar to himself, and being possessed of the confidence of his great patron, contrived such admirable machines, and took such methods to facilitate the progress of the work, that the world soon began to wonder how it could be thought so difficult.

When the canal was completed as far as Barton, where the Irwell is navigable for large vessels, Mr. Brindley proposed to carry it over that river by an aqueduct thirty-nine feet above the surface of the water in the river. This, however, being considered as a wild and extravagant project, he desired, in order to justify his conduct towards his noble employer, that the opinion of another engineer might be taken, believing that he could easily convince an intelligent person of the practicability of the design. A gentleman of eminence was accordingly called, who being conducted to the place where it was intended that

the aqueduct should be made, ridiculed the attempt, and when the height and dimensions were communicated to him, he exclaimed—"I have often heard of castles in the air, but never was shewn before where any of them were to be erected." This unfavourable verdict did not deter the Duke from following the opinion of his own engineer. The aqueduct was immediately begun, and it was carried on with such rapidity and success as astonished all those who but a little before thought it impossible. This work commenced in September 1760, and the first boat sailed over it on the 17th of July 1761. The particulars of the completing and finishing of this navigation to Runcorn Gap, into the river Mersey, I have before described.

The success of the Duke's navigation encouraged a number of gentlemen and manufacturers in Staffordshire to cherish the idea of a canal navigation through that country, and Mr. Brindley was engaged to survey it from the Trent to the Mersey; and upon his reporting that it was practicable to construct a canal from one river to the other, and thereby unite the ports of Liverpool and Hull, in 1766 this canal was begun by him, and called the grand trunk navigation, and was conducted with great spirit and success as long as he lived, and was finished by his brother-in-law, Mr. Henshall, who finished it in May 1777, to the general satisfaction of the proprietors, and joyfulness of the whole country. This canal is ninety-three miles in length, and besides a vast number of bridges over it, has seventy-six locks and five tunnels. The most remarkable of the tunnels is the subterraneous passage of Harecastle, 2880 yards in length, and more than seventy yards

below the surface of the earth. The scheme of this inland navigation had employed the thoughts of the ingenious part of the kingdom for twenty years or more, and surveys had been made, but Harecastle Hill, through which the tunnel is constructed, could neither be avoided nor overcome by any expedient that the ablest engineers could contrive. It was Mr. Brindley alone that surmounted this difficulty, and others arising from the variety of measures, strata, and quicksands, as no one but himself would attempt.

Soon after the navigation from the Trent to the Mersey was undertaken, Mr. Brindley designed and executed a canal from the grand trunk at Haywood, to the river Severn, near Bewdley, whereby the port of Bristol was united to the ports of Liverpool and Hull. This canal is forty-six miles in length, and was completed in 1772. Mr. Brindley's next undertaking was the survey and execution of a canal from Birmingham to unite with the Staffordshire and Worcestershire canal near Wolverhampton. This navigation was finished in about three years, and is twenty-six miles in length. The canal from Droitwich to the river Severn for the conveyance of salt and coals, was executed also by Mr. Brindley. He likewise planned the Coventry navigation, and it was a short time under his direction, but a dispute arising about the mode of execution, he resigned his office, which the proprietors of that navigation have since had cause to lament. Some little time before his death Mr. Brindley began the Oxfordshire canal, which unites with the Coventry canal, and that with the grand trunk, will form an inland navigation from Liverpool and Hull to London.— Although they were soon deprived of their able

engineer, the work was carried on and finished with success.

The canal from Chesterfield to the Trent at Stockwith was the last public undertaking in which Mr. Brindley was engaged; he surveyed and planned the whole, and executed some miles of the navigation, which was finished by Mr. Henshall, in 1777. There were few works of this nature projected in the kingdom, in which he was not consulted. He was employed in particular by the city of London, to survey a course for a canal from Sunning, near Reading, in Berkshire, by Monkey Island, to near Richmond; but when application was made to parliament for leave to effect their design, the bill met with such a violent opposition from the land owners that it was defeated. Those fine gentlemen would not suffer their villas to be disturbed by noisy boatmen, or their lawns to be cut through for the accommodation of trade and commerce, though it was from that only that most of those villas and lawns had existence.

Mr. Brindley had for some time the Calder navigation under his direction, but he declined a farther inspection of it, on account of a difference of opinion among the commissioners. In the year 1766 he laid out a canal from the river Calder at Cooper's Bridge to Huddersfield, in Yorkshire, which has since been carried into execution. In 1768 he revised the plan for the inland navigation from Leeds to Liverpool. He was also appointed the engineer for conducting the work, but the multiplicity of his other engagements obliged him to decline the employment. In the same year he planned a canal from Stockton, by Darlington, to Winston, in the bishopric of Durham. Three plans of the like kind were formed by

him in 1769. One from Leeds to Selby; another from the Bristol channel, near Uphill, in Somersetshire, to Glastonbury, Taunton, Wellington, Tiverton, and Exeter; and a third from Langport, in the county of Somerset, by the way of Ilminster, Chard, and Axminster to the south channel at Exmouth, in the county of Devon. In 1770 he surveyed the country for a canal from Andover by the way of Stockbridge and Rumsey to Redbridge, near Southampton; and in 1771 from Salisbury, by Fordingbridge and Ringwood, to Christchurch. He performed, also, in 1772, the survey for a navigation, proposed to be carried on, from Preston to Lancaster, and from thence to Kendal, in Westmorland. He surveyed, likewise, and planned out a canal to join the Duke of Bridgewater's at Runcorn Gap, from Liverpool. If this scheme had been executed, it was Mr. Brindley's intention to have constructed the work by an aqueduct over the river Mersey, at a place where the tide flows fourteen feet in height. He also surveyed the county of Chester, for a canal from the grand trunk to the city of Chester. The plan for joining the Forth and the Clyde was revised by him, and he proposed some considerable alterations, particularly with regard to the deepening the Clyde, which have been attended to by the managers. He was consulted upon several improvements to the draining the low lands in Lincolnshire and the isle of Ely. A canal was also laid out by him for uniting that of Chesterfield, by the way of Derby, with the grand trunk at Swarkstone. To the corporation of Liverpool he gave a plan for cleansing their docks from mud, which has been carried into execution with the desired effect; and he pointed out also the

method, which has been attended with equal success, of building walls against the sea without mortar. The boast of our great mechanic's inventions and contrivances, which I shall mention, is his improvement of the machine for drawing water out of mines, by a losing and a gaining bucket. This he also employed afterwards to advantage in raising up coals from the mines.

When any extraordinary difficulty occurred to Mr. Brindley in the execution of his works, having little or no assistance from books or the labours of other men, his resources lay within himself; in order, therefore, to be quiet and uninterrupted whilst he was in search of expedients, he generally retired to his bed, and he has been known to lie there one, two, or three days, till he had attained the object in view. He would then get up and execute his design without drawing or model. Indeed, it never was his custom to make either, unless to satisfy his employers. His memory was so remarkable, that he has often declared that he could remember, and execute, all the parts of the most complex machines, provided he had sufficient time to settle in his mind the several departments and their relations to each other. His method of calculating the powers of any machine invented by him, was peculiar to himself. He worked the question some time in his head, and then put down the result in figures. After this, taking it up again in that stage, he worked it farther, in his mind, for a certain time, and set down the result as before. In the same way he still proceeded, making use of figures only at stated periods of the question, yet the ultimate result was generally true, though the road he travelled in search of it was un-

known to all but himself, and it was not in his power to have shewn it to another.

The attention which was paid by Mr. Brindley to objects of peculiar magnitude, did not permit him the common diversions of life. He never seemed in his element if he was not planning or executing some great work, or conversing with his friends upon subjects of importance. He was once prevailed on, when in London, to see a play, having never seen one before ; it had a powerful effect upon him, and he complained for several days after that his ideas were disturbed, and rendered him unfit for business. He declared then that he would not go to see another play on any account. It might, perhaps, have contributed to the longer duration of so valuable a life to the farther benefit of the public, if he could occasionally have relaxed the tone of his mind. His not being able to do so might arise from his always being employed in great designs. The only fault that he was observed to fall into was suffering himself to be prevailed on to be engaged in more concerns than could be attended to by any one man, however eminent his abilities. It is apprehended that by this means Mr. Brindley shortened his days, and abridged his usefulness. There is the utmost reason to believe that his intense application in general, to the important undertakings he had in hand, brought on a hectic fever, which continued upon him some years with little or no intermission, and at length terminated his life ; he died at Turnhurst, in Staffordshire, on the 27th of September 1772, in the fifty-sixth year of his age, and was buried at New Chapel in the same county. The vast works Mr. Brindley was engaged in at the time of his death he left to

be completed by his brother-in-law, Mr. Henshall, for whom he had a peculiar regard, and of whose integrity and abilities in the conducting these works he had the highest opinion.

Thus was the world deprived, at a comparatively early period, of this great genius, "of mother wit, and wise without the schools," who very early in life, gave great indications of uncommon talents and extensive views in the application of mechanical principles, and who, by a happy concurrence of circumstances, the chief of which was the patronage of the Duke of Bridgewater, was favoured with an opportunity of unfolding and displaying his wonderful powers in the execution of works new to this country, and such as will extend his fame, and endear his memory to future times. The public could only recognise the merit of this extraordinary man in the stupendous undertakings which he perfected and exhibited to general view. But those who had the advantage of conversing with him, and of knowing him well in private character, respected him still more for the uniform and unshaken integrity of his conduct, for his steady attachment to the interest of the community, for the vast compass of his understanding, which seemed to have a natural affinity to all great objects, and likewise for many noble and beneficent designs, constantly generating in his mind, and which the multiplicity of his engagements, and the shortness of his life, prevented him from bringing to maturity.

Mr. Brindley was the greatest enthusiast in favour of artificial navigations that ever existed. Having spoken upon various circumstances of rivers before a committee of the House of Commons, in which he



seemed to treat all sorts of rivers with great contempt, a member asked him for what purpose he apprehended rivers were created ? Mr. Brindley, considering within himself a moment, replied, " To feed navigable canals."

Employment in so many considerable works had made him think there was nothing impossible to him. He had for late years a favourite scheme of joining the two islands by a floating road and canal from Port Patrick to Donaghadee, which he was confident he could execute in such a manner as to withstand the most violent attacks of the waves.

He had been so lowly educated that he had learned neither to read nor write, and afterwards went no farther than signing his name, yet he could cast up intricate accounts in his head without difficulty or error.

Louis XV. of France, upon hearing what he had performed, had an inclination to see him, and to have him view the canal of Languedoc ; but he said he would make no journies to other countries, unless it were to be employed in surpassing what was already done in them.

More panegyric on this great man is useless, nor shall I describe the Duke of Bridgewater's coal mine, I shall therefore proceed in short descriptions of canals as they follow :

#### NAVIGATION FROM LIVERPOOL TO HULL.

While the Duke of Bridgewater's curious inland navigation was carrying on, there were several views and surveys taken to discover if possible a route for an inland navigation from Liverpool to Hull. I cannot see this undertaking in a clearer point of view, than

from extracts from the resolutions passed at the meetings held on the subject, and from the different acts of parliament obtained, as also from a celebrated performance in which inland navigation is judiciously treated of. I shall also add some remarks and observations of my own, made on the different spots, having been employed in some of these works, and have attended others through curiosity; for there is a rational as well as ridiculous curiosity, and it is either useful or injurious, according to the disposition of the person in whom it prevails. In weak minds it is the source of levity and its ill consequences, but in noble and scientific minds it is the parent of industry, and the guide to every useful species of knowledge.

In beginning this subject it will be necessary to revert back as far as the year 1755, when the corporation of Liverpool, ever attentive to its trade and commerce, employed two gentlemen (Mr. Taylor of Manchester, and Mr. Eyes of Liverpool) to survey the country, and take levels, &c. with a view to join the Trent to the Weaver or Mersey, and to open a communication between those great sea ports, Liverpool and Hull, by which the traffic of the east and west seas might be carried on by an inland navigation not exceeding 150 miles, which now make a circuit of above 800 miles, and exposed to adverse and stormy winds. This inland navigation, it was proposed, should pass through Nottinghamshire, Derbyshire, Staffordshire, and Cheshire, and after an accurate survey it was found to be practicable. This survey was chiefly supported by the late Mr. Hardman, an active and able friend to the commer-

cial interests of this nation, and one of the representatives of that borough.

The public are also indebted to Earl Gower, now Marquis of Stafford, and the late Lord Anson, for another survey of the intended course of this canal, made by Mr. Brindley in 1758, and afterwards reviewed by Mr. Smeaton, F. R. S. and Mr. Brindley jointly; and these surveyors concurred in opinion, that no tract of land in the kingdom was naturally better adapted for the purpose of inland navigation, and that none stood in more need of it, or was so convenient for a union of the east and west seas.

In the year 1760 a public meeting was held at Sandon in Staffordshire, at which Lord Gower, Lord Anson, and a great number of the gentlemen land owners and manufacturers attended; but difficulties arising, further surveys were advised, and 1000 pounds subscribed, for the extending the surveys from tide-way to tide-way; another meeting was held the same year, and Mr. Smeaton and Mr. Brindley attended with their surveys according to their last orders. The result of this meeting I shall mention hereafter, and give the reasons why the second plan was approved and executed in preference to the first.

In the year 1765, two plans were offered to the public for a navigable cut or canal, to form a communication between those great sea-ports, Bristol, Liverpool and Hull, by a junction of the rivers Severn, Trent, and Weaver or Mersey; and as a great many gentlemen in the counties through which these rivers pass were divided in their opinions, some giving preference to one plan and some to the other, I beg leave to describe both in as concise a manner

as possible. As the extent of country through which they were to pass was great, so also would be the many advantages as well to agriculture as to trade, which I shall shew, and hope not to be thought prolix on a subject on which the interests of so many persons, and so large a portion of commerce was concerned ; and as one of these plans is executed, by exhibiting both, the public will be enabled to judge which seemed to be most beneficial to the country. And, first, I shall describe the plan and route of the canal (refused) as laid down by the author of the Advantages of Inland Navigation, and which is marked on the map with dotted lines. This writer was a gentleman of such property and local knowledge of the counties, and the trade and manufactures carried on in them (himself living in the center of them), that I am greatly surprised his plan was not approved, excepting in two particulars, which might have been easily altered, but as they stood I think very objectionable. These are, first, his not going into the Severn lower down, near Bewdley, than where his intention was, at Tern-bridge near Shrewsbury, to avoid the shallows that lie in the Severn between Bewdley and Shrewsbury, and must greatly retard the navigation between those two towns. The other is his not going into the Mersey at Runcorn Gap, or into the Duke of Bridgewater's canal at Preston Brook, which falls into the Mersey at Runcorn Gap, rather than by his plan into the river Weaver at Winsford-bridge, on account of the number of locks from thence to the tide-way to go to Liverpool. It is also to be observed, that if it had joined the Duke's canal at Preston Brook, the goods and merchandise brought by the canal from Hull

and Bristol by the Severn and Trent, might have been conveyed to Manchester, without going down those locks 75 feet into the river Weaver, and up as many more into the Duke's canal; besides going round a point of land, and being liable to the obstructions of neap-tides and adverse winds, by which barges may be retarded several days, and which I shall have occasion more particularly to explain, after I have given the route of both canals. But, before I proceed, it will be proper to observe that the route of the canal down the river Trent to Wilsden Ferry, is in order to avoid the shallows between Burton and Wilsden, rather than fall into the Trent at Burton, which would save a cut of fifteen miles. If the obstacle occasioned by the shallows was observed there, how it should have escaped the notice of a person of such discernment as the gentleman who planned the first route, not to go into the Severn below Bewdley, is to me inconceivable.

To begin then with the first plan for a communication between Bristol and Hull. It was proposed that the said canal should pass from or near a place called Tern-bridge, on the river Severn, in the county of Salop, and from thence a little higher up than the course of the river Wroxeter, cross the Uppington road, by Wansford and Allscot, and cross the road leading on the right to Wellington, thence by Crudgington (where the Tern comes from Drayton) thence up by the Wildmoors, by or near Chetwin Park, on the side of Pilson Hill, thence across the low grounds near Flashbrooke Hall, making its first entrance into Staffordshire at Whitley Ford, and proceeding thence by the river Whit at Batchacre Grange, and by the side of Hill Park, along Tun-

tal Moor into the valley below Offley Park mills, where the highest summit of the land is, thence it was to cross the brook that runs from Cockmeer in Eccleshall parish, and proceed by Pershall low grounds, Eccleshall and Byanna, down the valley to Hilcot and Chebney to the river Sow that comes from Standon, where, about a mile and a quarter above Bridgford, the proposed navigation from Liverpool by the Weaver was to unite with the Bristol. It was then to proceed along the meadows on the right hand side the river to Stafford, from thence down the river Sow across the Penk, and by Baswich to Haywood Park; from thence by the river Trent, crossing the same near Wolseley-bridge and behind Bishton House, over the river by Rudgeley, across the brook by Lee Hall, Armitage and Bromley, and across the river at Whichnor; thence by Branston and Seaney Park, leaving the town of Burton on the right by Monk's-bridge, across the river Dove to Eggington, being its first entrance into Derbyshire, and thence by Willington and Twyford on the right by Cliff Hill, Black Pool and Weston, and thence into the river Trent at Mr. Drake's warehouse at Wilden, where the river Trent is navigable without any inconvenience from locks, though there are some few shallows by Newark, Nottingham and Gainsborough, to the great sea-port Hull.

#### LIVERPOOL BRANCH TO THE BRISTOL BRANCH.

Having planned ~~out~~ the route of the canal from Bristol to Hull, I have now to describe the course of the Liverpool navigation from the Mersey to the place where it unites with the Bristol canal at Bridgford near Stafford. The river Weaver falls into the

Mersey at Frodsham, and is now by act of parliament made navigable by the means of locks as far as Northwich, and further up to Winsford, for the convenience of conveying the produce of the salt works to Liverpool. I would therefore propose, says my author, that a navigable canal should be made from Winsford on the river Weaver, by Weaver Bank, Minshull, and Barton Cross, near Nantwich, from thence along the valley to Wybunbury, Checkley and Rynhill-Hall, where it leaves Cheshire and enters Staffordshire; from thence through Madely Park, being the highest summit of land, and from thence near Whitmore, Stapleford-bridge, Standon, Walford, Millmeese, Coldmeese, Shallowford and Bridgford, where it will unite with the Bristol canal, and proceed to Wilden, and so as by the route before to Hull.

As I speak from surveys that have been taken, I make not the least doubt but the above scheme is both practicable and easy to be executed at no very large expense, considering the great national utility it will be of even to every individual. I will therefore proceed to shew how the same may be executed, after what manner, and, in regard to the expense, will calculate and come to as near a certainty as the nature of these sorts of undertakings will admit of.

I would first propose, says my author, that the land to be purchased should be eighteen yards broad, and the canal in breadth nine yards at top and six yards at bottom in water, and one towing path on each side four yards and a half; the depth of the water should be five feet, on account of the different kinds of boats that are likely to navigate it; but as there ought to be some restriction with respect to the

make of the boats ; I should think they ought to be fifty feet long, eleven feet broad, and built after the form of those made at Bridgenorth on the Severn, nor ought they draw more than three feet and a half when loaded. This kind of boat would better suit the navigation in regard to their passing one another, and the preservation of the banks, and may be so built as to carry thirty tons, and cost about fifty pounds, with a mast, mainsail, tow-line, &c. There might be a covered place in the steerage for a man and a boy to sleep in, as they frequently want such a convenience when they have any valuable goods on board ; it then would be very imprudent for them to sleep on shore lest they might be stolen. There might also be a forecastle six or eight feet long for the same purpose. These vessels will carry goods from Bristol to Liverpool or Hull, without the trouble and expense of reshipping, as those boats now used by the Duke of Bridgewater on his canals in Lancashire will not bear the navigating in the tide-way beyond the Hempstones, and on that account are both troublesome and expensive, being seventy feet long and six feet broad. They also require double the quantity of water and labour in carrying the same quantity of goods through a lock, that the vessels I here propose do. The sorts of boats most convenient cannot be properly ascertained till the canals are finished.

As this navigation must be open to all persons, it will therefore be somewhat difficult to confine every one to have their boats built in such a certain manner as to prevent their damaging in their passage any part of the banks of the canals, and to procure the observance of all such rules and orders as may be



made for the good of the same ; upon that account I have allowed as a great breadth for the top of the canals as possible to obviate the above inconveniences, which are avoided in private navigation, where all the vessels that can be used upon it are the property of one person, and the whole together, both men and boats, immediately under his own direction.

The expense of these canals will come to about 900 pounds per mile, including the purchase of lands, erecting locks, building bridges, and making the towing paths on each side ; and surely this is not to be considered as a large sum when it is well known that many turnpike roads in England have cost 1000 pounds per mile only to repair them. Then let us imagine the vast difference there will be in the carriage of goods, &c. between one and the other. We will say, for example, for a mile on any such turnpike road 1000 ton of goods may be carried in a year, and probably the passage of goods upon one mile of these canals, may not be less than 100,000 ton, therefore why can we think the expense great, according to this proportion of repairing turnpike roads, when all goods may be conveyed from east to west, much cheaper and safer by these navigable canals, and the price of carriage will always continue the same ; whereas land carriage differs according to the badness of the roads, or the number of carriers, and is often subject to great inconveniences, not to mention that all sorts of brittle goods are subject to be broke by loading and unloading into different waggons ? It must therefore be allowed that water carriage is far preferable to land carriage, especially

on these canals where boats would meet no difficulties, but always arrive at the appointed time.

The distances from place to place as follows: From Tern-bridge, where the canal begins, opposite Batch-acre Grange, twenty miles and nine perches; from thence to the highest point of land in the course of the canal below Offley-Park, four miles and five perches; from thence to the junction of the river Sow, where the Liverpool canal joins, six miles; thence to Bridgford one mile and quarter; which makes thirty-one miles one quarter and one perch. To Stafford three miles three perches; from thence to Wolseley-bridge, where the river Trent is crossed by the canal, six miles one quarter; from thence by Bishton to Wilsden Ferry, thirty-two miles; which makes forty-two miles. The distances on the Liverpool part of the canal are as follow: From the meadow above Bridgford in Staffordshire, where it joins the Bristol canal, to Madely Park, being the highest summit of land in the course of the canal, near which place the canal runs both ways, N. W. and S. E. is ten miles and a half; from thence to Barton Cross thirteen miles; from thence to Winsford-bridge in Cheshire nine miles one quarter and six perches, which makes thirty-two miles three quarters and six perches,

The fall westward, between Tern-bridge and the highest summit of land in the course of the canal, where the water runs both ways, which is in the valley below Offley Park, is 136 feet nine inches, from thence to Bridgford eastward it is fifty-four feet eight inches; from Bridgford to Stafford Mill Pool, and to the crossing the Trent near Wolseley-bridge

and to Wilsden-ferry, is 160 feet ; between Bridgford in the Liverpool canal, and the summit in Madeley Park, the fall is 100 feet three inches, and from thence to the Weaver, by a west course to Winsford, it is 284 feet, one inch.

It is not material here to give the length, distances, and falls of water ; I shall pass them over, and proceed to more important observations. The reader will here observe, that the high summit of land between Offley Park and Cockmere brook, a distance of a mile and a half, is an elevation of twenty-five feet, into which I propose digging and removing the earth eighteen yards wide, the breadth of the canal, towing paths, and drains, which I reduce to a level that breadth, and a fall decreasing each way one mile and half. In the whole there must be removed 198,015 cubic yards of earth, which, at three-pence per cubic yard labour would, cost £ 2,475. 3. 11. which reduces the level, and makes the fall to Tern-bridge westward 136 feet nine inches, and to Bridgford eastward fifty feet eight inches, by which means four locks will be saved.

The author next subjoins a copy of the proposals for executing this great design, and considers in what manner to proceed in order to obtain an act of parliament for promoting its being effected and executed.

Proposals (to be printed in all the public papers) for meetings to be held at Bristol, Liverpool and Hull, and at all the intermediate towns, to invite the masters of the great furnaces and forges at Sambrook, Keinton, Tibberton, Upton-under-Hayman, Coalbrook Dale, Ketley, Horsey, Wytheyford, Moreton, Welley, Pitchford, Sutton, Longnor, and all

the large various manufactories lying upon the intended navigation or Severn, to attend and concur with the land-owners in a petition to parliament. Then follows the form of the petition, and also a memorandum of the agreement or consent of the land-owners through whose lands the canal is to pass, and the form of a subscription paper for raising the sum necessary for an application to parliament. He next gives the proposals for raising the fund to defray the expenses of making and finishing the said canals, which he estimates at 116,000 pounds, which sum it is intended shall be divided into 580 shares of 200 pounds each, and that no person shall have above twenty shares, and that the money shall be advanced by each subscriber in equal proportions as wanted, and bear lawful interest, from the paying such sums till the navigation shall be completed, and from the time of the completion thereof, to receive the proportion of the profits arising thereby, according to their shares, which shall be made transferable by a clause in the act.

The following are the resolutions agreed to.

At a very numerous meeting of noblemen, gentlemen, land-owners, traders and manufacturers, held at the Star Inn, at Stafford, tenth of August, 1766, it was unanimously agreed, that application should be made to parliament this session, for an act to make a navigable canal from the river Severn at Tern-bridge in the county of Salop, and the river Trent at Wilsden in the county of Derby, and also from the river Weaver at Winsford-bridge, in the county of Chester, to communicate with the above at Bridgford on the river Sow, in the county of Stafford :

That it will be most convenient for the execution

of this undertaking, if the making and completing the said navigation, which has been estimated at 116,000 pounds, were to be distributed into 580 shares, and raised by subscription, and that no person shall have more than 20 shares ; the money to be advanced by each subscriber, in equal proportions, as the same shall be wanted, and the shares made transferable by a form prescribed by the act :

That a subscription be immediately opened to raise a fund to support the necessary expenses of procuring the act ; that the money so subscribed, after obtaining the act, be repaid to such subscriber in part of payment of their shares :

That a subscription be also opened for the money which shall be wanted for making and completing the said navigation ; that twenty days be allowed to complete the subscription ; that the subscribers names may be entered with —, of Bristol, Gloucester, &c. &c. and all the towns, here named, in Staffordshire, Derbyshire, and Cheshire, with Liverpool and Hull, where books will be opened to receive subscriptions for that purpose, and an account is desired to be transmitted at the end of twenty days to —, of Stafford (being about the center) of the subscriptions at each place, and if not then complete, to be left open until it is ; the first subscribers to have the benefit, if the subscriptions exceed the sum wanted, of voting, according to their number of shares, in an annual choice of a proper number of directors, to be limited in the act, who shall have the management and inspection of the work ; and that commissioners shall be named in the act to determine all controversies and disputes that may arise : that provision be inserted in the act for

making full satisfaction to the land owners and their tenants, for all lands to be taken in for the use of the navigation, and for all damages, both present and future, which they may sustain thereby, and for giving all proper conveniences, to such land owners and their tenants: that it be proposed for the consideration of parliament, that a proper toll shall be taken as tonnage, to be fixed by the act at about 1s. 6d. per ton for each and every ten miles; that each vessel shall pass on the navigation, and also that the subscribers be paid five per cent. for their money in the respective sums advanced, from the time of their paying in the same till the whole communication between the three ports shall be completed, and from that time to receive their proportion of profits, according to their shares, and that the subscribers be permitted to vote by proxy:

That no toll be taken for stone, gravel, or other materials for repairing the roads, nor for dung, soil, or lime, or other manure used only to improve land:

That these resolutions be printed in the public papers three weeks successively.

The interest of the country and the public good are afterwards so judiciously discussed in this excellent treatise, and the manner as well as matter of the natural produce and manufactures so particularly and minutely treated, that I should leave this part lame and defective, were I to omit the author's observation on this subject. Besides, were I to describe the produce and manufactures on the route of one canal and not on the other, it would be impossible for an impartial judgment to be formed; therefore I think it most conducive to the interest and pleasure of the reader, to finish one account before I begin another:

for this reason I shall resume the subject in the author's own words, or I should do injustice to all parties, who says—

“ I have now gone through the forms and proceedings, except the levels and estimates necessary for obtaining an act of parliament for the carrying into execution the foregoing plan of the navigation between the three great sea ports, Bristol, Liverpool, and Hull. I shall now proceed to add some observations on the inland trade, and the increase of the export trade, of this country.

“ The vast importance that trade is of to this nation is too frequently and too strongly instanced, even in the disturbances of any manufacture whatever, which seldom fails to draw, not only the attention of the people, but also the serious consideration of the legislature to interpose and alleviate their calamities and distresses. The late uneasiness of the weavers in London, was a striking instance that the least indulgence to admit foreign goods into this kingdom, (when our manufacturers in Spitalfields were able to furnish as good, if not better), and preferring them to our own was a clog upon our trade ; and the distress of a few had like to have embarrassed the rest of the nation to find redress for their complaints. Nor can I get out of my head the present stop to all sorts of trade (1766) in these parts, and the dreadful situation that thousands of families are in from the refusal the noble Americans have lately made of having any trade or communication with the mother state, entirely occasioned by an imprudent and ill-considered measure taken by the late administration, by advice of the financier, Mr. G. G. in arbitrarily imposing the stamp act upon the Americans, in the

illegality of which, reason, argument, and humanity have refused to be parties concerned.

“ I have said that to trade we owe our opulency, and for that conveniency by far the greater number of the nation have fixed themselves in towns, and have stripped the country of every laborious cottager, lately swarming with a cluster of healthy children, by the landlords laying their farms into large takes, thereby entirely ruining those useful body of men, the small farmers, most of whom, rather than only hedge and ditch where they had lived in comfort, have now emigrated to America ; therefore the greater numbers have got together, that could not emigrate, and trafficking with each other, it is natural, even on that account, to have a greater regard to their prosperity ; and as they subsist by trade alone, it is fitting the nation should do all they can to protect, increase, and encourage them : in short, it is by trade alone we live, and by society we are made happy, they being brought about by an easy communication and connection one with another, throwing the whole nation, as it were, upon a kind of equality, giving to every man liberty to improve. Among the ancients, commerce did not appear unworthy the application of persons of the first rank.

“ Solomon, we are told, frequently joined his merchants' fleets with those of the king of Tyre, for their voyage to Ophir ; and by this means rendered himself, though in a little kingdom, the richest king of his time, in the universe. How greatly did trade flourish under the Romans ! what vast companies of merchants in the different cities are mentioned by historians ! and we always find that those nations that abounded most in shipping and navigation were



the first leaders in trade, and spread themselves in all the ports of the Levant and Egypt. The Greeks and Romans thus acquired their lustre and power ; and upon the ruins of them is our modern commerce founded, trading to the same places. It is morally impossible for men to flourish without the assistance of each other, as well as an easy communication from place to place. What makes the Dutch not only vie with all the world in trade, but really eclipse them ? What but their vast conveniences of inland navigation, by which the produce of all the internal parts of the provinces becomes an external commodity, and is carried to the farthest parts of the globe, returning to the industrious labourer (who was the original proprietor of what would have been of little value at his own home) triplefold, and the returns made in things the most useful to his family ? It was the easiness and practicability of making canals that first led the Dutch to trade and commerce, in which it must be allowed they exceed all other nations, and entirely owing to their canals. The trade of Great Britain may claim some place under the shield of commerce, but it seems astonishing to a cool considerate mind, that Britons should never heretofore think of inland navigation, nor endeavour to effect an easy and mutual intercourse through the whole island, and let each subject share the gifts of nature in a more equal degree, by which the exports would be doubly increased, and there would be a greater demand for the imports.

“ The advantages, from these canals, to this nation would be very great, as every person must allow that the stamina of our trade is the internal produce of the kingdom ; and the nearer each

manufacturer is to his market, the greater price his goods will take ; for instance, if a person manufactures a piece of cloth, (such as is usually sent abroad to America or elsewhere), in the county of Stafford, where he lives, forty miles from the merchant's ship that is to carry it abroad, will he not be obliged to sell it, upon account of the heavy charge of land carriage, for a much less price than if he could convey it at an easy rate to a sea-port, by a canal, and there sell it at the same price that a factor would ? Let us only consider that the factor buys up the goods or manufactures of fifty poor people, and conveys them to a merchant, at a large profit, which falls into the hands of the factor alone, and enriches only one ; whereas, were each manufacturer to have the conveniency of conveying his own goods directly to the merchant, all the profits monopolized by the factor would be divided between the fifty poor persons, and enrich that number instead of one. The more hands any goods or merchandise go through, the dearer they are to the consumer, as every person through whose shop they go must have a profit ; but in this case the factor monopolizes the whole profits of fifty poor manufacturers.

“ In case of invasion or rebellion, by these canals government would be able to transport their heaviest cannon to any part of the country in a short time ; as also regiments with their baggage might be conveyed in a much safer way than by long, tedious, harassing marches, through bad roads, that are almost impassable, and oftentimes far round to the point they want to come to ; besides the saving in artillery horses, and the expense of baggage waggons to government, which usually amounts to nearly as

much as the pay of one third part of the regiment for the time. Every person must remember the great difficulties encountered in conveying the cannon and other military stores, in the rebellion in 1745, even only eighty miles from the metropolis, so excessively bad then were the high roads of the western parts; and indeed to speak the truth, were government to have occasion now to convey the same military stores, there would be but little more expedition, unless they could be sent by navigable canals.

“ It has been a common objection against navigable canals in this kingdom, that numbers of people are supported by land carriage, and that navigable canals will be their ruin; and it has often been said, to remedy that inconvenience, that those people may take to other trades, and turn farmers or navigators, and instead of driving waggons learn to steer and navigate a boat, which, in time of war, may turn out to the advantage of the navy, or merchants’ service, upon both of which our safety depends. But I, more supple to the inclinations of my fellow-countrymen, am unwilling to unbend the crooked finger, or straighten the distorted joint, inured to tally with the stroke of its accustomed trade, and at his old age deprive him of the art of his employment, and leave him in his second childhood to begin the world anew; and as the land carriage is chiefly carried on from the trading towns and their neighbourhood, I must advance a very uncommon alterative, which would free the carrier from any fear of losing his employment, or selling off his stock, viz. That no main trunk of a navigable canal ought reasonably to be carried nearer than within four miles of any great trading or manufacturing town, considering the

present state and situation of affairs, and the propriety of blending the landed with the commercial interests; which distance from the canal is sufficient to maintain the same number of carriers, and almost as many horses, as usual, to convey the goods down to the canal, in order to go to the sea ports for exportation. When any person forms a project for the general advantage of the nation, he should also consider that of every individual, and be careful that one is not burthened, in order to unburthen another. I have, therefore, made this uncommon proposal to favour the landed as well as the commercial interests; for I think it certain, considering both interests together, that it is not for the benefit of every individual, in a trading city, to have the navigable canal come close to their town, but that the same should be at a proper distance, suppose about four miles, so that each trade may have some employ, those who carry the goods, as well as those who manufacture them. There is no doubt but the person who manufactures the goods might afford to export them cheaper by having the canal come close to him; but then we must consider all parties when we talk about trade, and not let the carrier starve while the traders and manufacturers ride in their coaches. If a manufacturer can have a certain conveniency of sending his goods by water carriage, within four miles of his own home, surely that is sufficient, and profit enough, considering that other people must live as well as himself, and a proportion of profit to each trade should be the blessing and leading policy of this nation.

“It has often been objected that an inland navigation destroys that noble breed of draught

horses, since there will be little or no occasion for them ; and upon that account the farmers would not be able to sell their oats : and it has as often been pleaded in excuse that the farmer might then turn his oat ground into wheat ground, and instead of so much land being employed to furnish food for 1000 horses, the same land, when turned into tillage fit to sow wheat upon, might produce sufficient bread corn to feed 2000 poor families. I have not leisure here to discuss each point so fully as I could wish ; therefore as I have explained the commercial and landed interests in a medium way, I will rest this upon the merit of the former clause.

“ There certainly is nothing which requires the attention of the people of this nation more than the progress of husbandry ; and in attending to that, we cannot have too great a regard to the interest of the farmer, and to ease him as much as we can in the burthens and hardships he undergoes, and which are such as even to reduce him to support himself and family on skimmed milk, whilst he saves the cream for the rest of his fellow-creatures, and disperses it abroad in the nation to the nourishment of thousands. What great advantages will he not receive from these canals, by being able to sell his corn, and carry it to any market at any time of the year ; and as the plenty of corn in this kingdom, and the easy conveyance of it from one place to another, is what will make a greater equality through the whole kingdom ? and when it is cheap at home he will be able to get a better price for it at another market ; and if it should be dear, any quantity might soon be brought from another country to supply their wants, by which means it would always keep at a medium price the

whole communication through, or in any place within twenty miles of the canal. It would then be an uncommon thing to hear of a riot on account of the dearness of corn. (Had Mr. Whitworth been now alive he must have recanted the above). And I cannot help observing that if corn and provisions are cheap, the manufacturers might be able to work cheaper, and in so doing might always keep up a good export to foreign markets, in being able to undersell other nations, and at all times to have a market, on account of the merchandise being sold cheaper at foreign ports in preference to other nations.

“The exportation of corn is at this time (1766) one main branch of the trade of the nation, and ought to be countenanced, I mean in a proper degree, and bear a proportion in the exports according to the price or scarcity of it. Whilst corn on an average is not more than five shillings and six-pence per bushel, let the exports be uninterrupted; but when it advances higher than six shillings, it is time to stop it in a proportionate degree. I hope when I say it is a branch of our trade, that the sum of 7,500,000 pounds which from the year 1746 to 1750 inclusive was returned to this kingdom for 5,000,000 of quarters of grain exported (as appears from an account laid before the House of Commons in 1751) will be a proof of its importance. Surely this well deserves some attention as a main branch of our trade, and such a one that under our present happy government will always increase instead of diminishing, as the basis of that trade is the yearly product of our lands, and the materials always within ourselves, and whilst agriculture is daily improving, and the quantity of tilled land

(from the inclosing of commons) is daily increasing, this seems our natural trade, and all others appear as if grafted here from a foreign soil, and sometimes are too apt to canker at the root. How great will be the increase of the exportation of corn from these inland canals, when every farmer in the adjacent counties can almost as it were ship off his corn from his own barn, and receive all the profits himself that the factor used to have from the merchant ! I will now endeavour to shew how much he will be a gainer by this convenience. Let us suppose that a farmer in Staffordshire (from whence immense quantities of corn are carried to Woor or Sandbach by land carriage, in order to go to Manchester for home consumption, and to Liverpool for exportation) carries for instance one ton of corn, which he hath agreed with his factor to deliver at Woor or Sandbach in Cheshire ; the charges of his team, himself and man, going fourteen miles, will not be so little as twenty shillings, as he must be out two days, when he may send the same quantity of corn in a boat of his own for eighteen pence per ton for each ten miles, so that it would not cost him, charges included, more than five shillings ; but if he should pay freight, it might be about eighteen pence more for each ten miles, than if he had a boat of his own ; but I will go farther, and say that he might deliver it at Liverpool himself at the same tonnage and freight, which would amount to a very trifling sum more, at which place he would receive all the profits that the factor used to have by such conveyance ; his horses may then be employed in improving his land by carrying manure to it, and he might inclose and till more lands which are now waste grounds and commons. How

greatly would agriculture be improved, and the increase and produce of our land fulfil the proverb of returning ten-fold, and the shepherd made happy by the increase of his sheep ! I cannot omit mentioning, before I conclude the enumeration of these general advantages, the immense convenience that the merchants at the three ports will receive from being able to send their merchandise by this canal from Bristol to Hull, which is in fact joining the east and west seas together. A merchant that trades from Bristol to the N. E. parts of the globe, will send his goods by this canal to be shipped at Hull ; and also a merchant at Hull trading to the S. W. will send them by the same canal to be shipped at Bristol, by which means they will avoid that most tedious and hazardous voyage of two months round the Land's End, and also the expense attending that long voyage, and will find themselves gainers.

“ The great advantage that this kingdom will derive from a less number of horses being kept for draft is prodigious, as the same lands that kept 20,000 horses, will now, perhaps, keep 30,000 fat oxen ; by which means butchers' meat will be always cheap to the labouring poor, and the quantity of fat from so many beasts will of course make candles cheap, and so many hides will lower the price of leather, and so of shoes, and all things made of leather. Or the same quantity of land will keep 30,000 cows, the milk of which will make both butter and cheese cheaper, all which articles are very considerable and of material moment in the price of our manufactures, as they, in a great measure, work their trade to rise and fall in price according to the cheapness of materials and the necessities of life.



“Inland navigation will encourage old manufacturers to work with fresh vigour, when they can obtain their materials cheap, and will give opportunity to set up new ones, as the materials may be conveyed any where.

“There are many large mines with valuable contents, that, for want of carriage and conveyance, are useless, such as stone, iron ore, marble, and quarries of various sorts, that would then be opened and worked, and be productive of the greatest advantage to the proprietor, as well as to the kingdom at large, in which they might be purchased at an easy rate.

“The coasting trade seems to claim mention of the great advantages that will accrue to it by these navigable canals, as all or most of the goods that have usually gone by land carriage from London to these countries will now be sent by shipping to the ports, and from thence be dispersed to their destination by the canals; for the more you open a channel the more water is drawn from the head, and works its way farther on.

“They will certainly cause more shipping to be employed on the coasts, and more sailors to navigate them. I must here make one observation, that old men and worn out sailors may be employed on these canals; and those whose constitutions will not suffer them to go a long sea voyage, may do very well to navigate these vessels on the canal. Every boy in each village through which the canals pass will have a desire to become a sailor, and will be trained up in his early youth to hand a rope, and soon become serviceable on board a ship, by which means these canals will become one of the most natural nurseries

for seamen for his Majesty's fleets, and the protection of this island ; as also of shipwrights upon any emergency ; both which are certainly great advantages to any state.

" These canals will also be of great advantage to the landed estates, as more persons will now come and settle themselves on many commons adjacent to the navigation, for the benefit and conveniency of trade, and thereby improve and inclose those barren lands ; and the present inclosed lands will receive great benefit, either by draining some that want it, or flooding others, which is reckoned a great improvement to meadow lands.

" I think the result of every plan and scheme for the public service should ultimately terminate in giving assistance to the distresses of the poor, and relieving their wants, by letting them have the necessaries of life at a cheap rate. This I term charity to our brother. This is the stamina of our trade, and a principal security for our present and future affluence.

" It is as impossible that the immense advantages that will accrue to this nation, in a variety of instances, from inland navigation, should be enumerated by one pen, as it is to number the sands on the shore ; I shall therefore proceed to point out some local advantages to the manufacturers only, bordering on these canals.

" I will begin with the country about Tern-bridge, in the county of Salop, as the canal begins there from Severn. The amazing number of large iron works within four or five miles of that place, and all the way to Batchacre Grange, are astonishing. There are five large furnaces, viz. Coalbrook Dale, Madely

Wood, Lightmore, Horschay, and Ketley, which are computed to turn at least eighty thousand pounds a year each; and nine large forges, which may be computed to turn twelve thousand pounds a year each, viz. Keinton, Tiberton, Upton-under-Haghmon, Withiford, Moreton, Pitchford, Sutton, Longnor, and Sambrook. There are several other iron, coal, and lime works, and large manufactories in the neighbourhood of the rivers Tern and Severn, that will border or lie within four miles of this intended navigation. There are also on the Cheshire side, lying on or near the river Sow, two more furnaces, viz. Madeley and Doddington, which may be computed as above; and four forges, viz. Lea, Winnington, Norton, and Warmingham, to be computed as above, besides many other iron and coal works, and other manufactories.

As the great iron trade here carried on is but little known in other countries, I will proceed to shew what weight of carriage, and number of tons of materials used in that branch alone comes in and goes out. As I collected my information from a master of one of the iron works, I hope it will appear that I have under-done rather than over-done it. I shall, therefore, next shew the number of tons coming in and going out weekly and yearly.

Six furnaces, computed to turn yearly

each ..... £80,000

Two ditto omitted.

Twelve large iron forges, computed to turn

yearly each ..... 12,000

Two ditto omitted.

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£624,000

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"The weekly consumption of the six furnaces and twelve forges before mentioned, is, on a medium,

|                                                |     |
|------------------------------------------------|-----|
| Tons of ore brought in, and pig iron .....     | 467 |
| Ditto of iron manufactured going out weekly .. | 252 |
| Ditto of pit coal used weekly .....            | 237 |
| Ditto of charcoal used weekly .....            | 59  |

"The above totals, multiplied by 52, make the yearly consumption as follows:

|                                             |        |
|---------------------------------------------|--------|
| Tons yearly brought into the above furnaces |        |
| and forges .....                            | 24,284 |
| Ditto yearly going out manufactured .....   | 13,164 |
| Ditto yearly consumption of pit coals ..... | 12,324 |
| Ditto yearly consumption of charcoal .....  | 3,068  |

N. B. There are many more iron works that lie within distance.

|                                   |               |                |
|-----------------------------------|---------------|----------------|
| Total amount yearly of tons ..... | 52,780        | Tons.          |
| Reckoning on an average at 15s.   |               |                |
| per ton, the present price of     |               |                |
| land carriage costs yearly        |               | £39,585        |
| Deduct from the above for home    |               |                |
| carriage of pit coal for Salop    |               |                |
| furnaces .....                    | 9,360         | 7,020          |
|                                   | <u>43,420</u> | <u>£32,565</u> |

"So that the sum 32,565l. is the present price of land carriage yearly to these iron works alone: out of which we will allow 5s. per ton for land and water carriage at 1s. 6d. per ton for each ten miles on the canal, and the remaining 2s. per ton for land carriage, any where within six miles of the canal; so that it will stand at 10s. per ton, which amounts to 21,710l. for the money saved yearly to these iron works alone by this canal, supposing the whole of the same be conveyed upon it.

“ We must observe, that the foregoing calculations are made within a circle of 20 miles. They frequently send iron to Burton by Ivesey Bank, which might be sent by these canals; and also to Chester, and many other places at a great distance. By lowering this heavy charge of carriage, the iron masters will be able to afford to manufacture their iron much cheaper, and consequently be able to undersell any foreign markets, or any iron that shall be imported; and in a few years will prevent the use of any of it, by being able to sell at a lower price than foreign can be sold at. As long as iron takes a price, it will always be imported; and whatever iron comes to a sea-port, whilst our home-made iron is at a high price, will always work itself into the heart of the kingdom, let the conveyance be as difficult as it will; but when once your materials come cheaper to you to manufacture your iron with, you will be able to sell cheaper, and by that means only will prevent the importation of foreign iron.

“ Cumberland ore alone is a very important article, which will entirely be conveyed along this canal from Frodsham in Cheshire: a very small furnace will use 1100 tons of it in a year, which comes now entirely by land carriage from Winsford-bridge, in Cheshire, at 6s. per ton for a small distance, which may be conveyed by these canals to all or most of the furnaces and forges. If Liverpool and Hull should ever have a separate navigation, they will send foreign iron into those countries, which these iron works, I now have been speaking of, used to supply. I have therefore proposed this plan for the junction of the three ports at the same time, otherwise the iron masters about the Severn in Shropshire would have

no opportunity of such easy conveyance, and consequently lose the market, and must of necessity decrease their sale, and greatly injure their works. I have dwelt thus long upon the iron trade, to shew that no branch of manufacture can reap more immediate benefit of these canals, or more sensibly feel the want of them, when other parts of the kingdom have them.

“ The next article of trade is the immense number of great coal works that lie bordering on this canal in Shropshire, Staffordshire, and Cheshire. I will first mention those at Ketley in Shropshire; from which many thousand tons of coal are conveyed yearly to Shrewsbury by land carriage, which might be sent by water. There are very great lime works near this canal, belonging to Brook Forrester, Esq. at Steeraway. The tons of lime got yearly is about 20,000, used for manure of land and building; 10,000 tons of which might be carried by water. About Newport, at Linsell, are very large coal and lime works, belonging to the Marquis of Stafford and others, the produce of which is very great, being computed yearly at 35,000 tons of coals, and 35,000 tons of lime; 10,000 tons of each of which might be conveyed to the north, east, and west parts of these countries, and might almost be delivered into the boats at the works, as a canal might easily be made at the bottom of the hill by Cheshul Grange, to unite with this canal a little below; the whole of the land to be cut through is his Lordship's property; and if his Lordship did not choose to do it, the proprietors would gladly undertake it. The towns of Eccleshall and Stafford, and the countries between, might be supplied at a cheap rate, and firing come reasonable

to poor people. There are likewise several large coal works about Madeley Park, viz. Leysit, Scotthay, and others, belonging to Sir Nigel Gresley, Mr. Crew, Mr. Meynell, and Mr. Pool. There is also limestone at Bishops Offley, but which, for want of coals to burn it with, is made no use of. There are also other large coal works in Cheshire, that go by various names, which supply the furnaces there, and also the towns of Nantwich, Betley, and all the neighbourhood. Nantwich alone may be computed to use 12,000 tons, and its neighbourhood to Winsford about 15,000 tons more, all which might be conveyed along this canal from Madeley pits in Staffordshire; and instead of costing 10s. per ton land carriage, would cost only 1s. 6d. per ton, besides about that sum more for freight; so that the price of coals alone will be decreased to the labouring poor, and to the consumer, 7s. out of 10s. who would also be able to fetch them at all seasons of the year.

“The next article that will prove the usefulness of these canals is the lime, which is used for the manure of land, and is a most excellent and quick improvement. It has hitherto been used only where the carriage comes easy; it will therefore now become general, and many lands that have never yet been improved by it, will quickly assume another appearance, and demonstrate the great utility of inland navigation.

“I cannot omit mentioning the great quantities of cheese that are yearly carried to Bridgenorth fair from most parts of Cheshire and Staffordshire; it is impossible to make an exact calculation, but I will suppose 1000 tons at least, which are now carried by waggons for 20 or 30 miles, being obliged to stay.

out with their team, at a great expense, three or four days, at not less than 30s. with two tons of cheese only; which might be conveyed on the canal 20 miles, freight and tonnage for 6s. only, and from Tern-bridge to Bridgenorth for 3s. more; so that in this article one guinea is saved in 30s. besides having the horses at work four days at home. Surely, from this convenience, the farmer can afford his cheese cheaper, and the poor have provisions at a more moderate price.

“The next manufacture that seems to claim our attention, with respect to diminishing the heavy burdens of land carriage, is the potteries of Burslem and Newcastle, great quantities of which are sent weekly from thence to Bridgenorth, through Eccleshall and Newport. There are constantly two, and sometimes three waggons which go every week to Bridgenorth, and carry about eight tons of ware, to be conveyed to Bristol by water; and their back lading usually consists of all sorts of groceries, foreign iron, and white clay for Burslem, to supply the inland towns of Newcastle, Stafford, Eccleshall, and Newport, and others. Sometimes they bring hops and cyder from Worcester. The back carriage of the iron and clay, being heavy goods, may be computed at ten tons per week. But as there is a great traffic carried on in the cyder and hops by waggons hired on purpose to fetch them, I will therefore compute that 2000 tons of hops and cyder come yearly into these countries, and far beyond them into Cheshire; the whole of which might be conveyed by this canal, and 7s. per ton saved out of every 10s. now paid for land carriage.



“ Large quantities of pottery ware from Burslem are now carried on horses’ backs in crates to Bewdley and Bridgenorth, which might be entirely carried by the canal, suppose we compute it at 100 tons, at 2*s.* 10*d.* per ton, from Burslem to Bewdley, whence they are sent to Bristol for exportation.

“ I must not forget the number of pack horses, about 150, that go weekly with woollen cloth, and various other kinds of merchandise, for exportation, from Manchester, through Stafford to Bewdley and Bridgenorth, computed yearly at 312 tons of carriage, which might be conveyed full half the way by water, from Manchester to Northwich by land carriage, and from Northwich by water to Bewdley or Bridgenorth, which would be nearly 100 miles by water; by which easy carriage the merchants at Bristol would be able to export their merchandise much cheaper, and undersell any other merchants at a foreign market: the manufacturer would also have his share of a profitable voyage, and by a quick return from the merchant would enliven his poor workmen, with future hopes of employment, by a ready market.

“ There is a great trade carried on at Shrewsbury in coarse cloths and flannels, which come out of Wales, and supply a great part of Shropshire and Staffordshire bordering on the canal; by which they may be conveyed to Liverpool to be exported, and may be computed yearly at 1000 tons, passing 60 miles on it.

“ I cannot omit the great salt trade carried on at Northwich. The salt, which can now only go to Liverpool by water, when this canal is made, may be conveyed at least one half to Bristol; and that

made at Nantwich, which is now carried on horse-back, to serve three or four inland counties, and is not less than 400 tons, may then be conveyed 80 miles on the canal in these counties.

“ The great trade that Chester enjoys from Ireland in cloths and linen, and which occasions so great a fair to be held there twice a year, must, without doubt (whenever Chester shall have a canal to unite with this at Nantwich, which may be easily effected) be conveyed from the fairs at Chester along this canal to Northwich, Nantwich, Eccleshall, Stafford, Newport, Drayton, Salop, Bridgenorth, and various other towns, and the intermediate countries. The tons of cloth and linen only may be truly computed at 2000, forty miles upon an average, water carriage, on this canal.

“ The quantity of Cumberland red ore, that is used at Doddington furnace in Cheshire is about 1100 tons a year. It is brought from Frodsham, over Delamere Forest, in carts, at a great expense. Could the great furnaces at Ketley in Shropshire be supplied with this ore by water, the six furnaces there (which now buy Cumberland pig iron) would use upwards of 12,000 tons to serve the forges, and would be brought 60 miles at least along the canal.

“ The great quantities of fine hard brick for floors, and blue tiles, that are sent for to Madeley Park from various parts of Staffordshire and Shropshire, and are conveyed at great expense by land carriage, may be computed at 200 tons of bricks and tiles, that would be carried to all parts bordering on the canal. Let us suppose a farmer goes ten miles for a load of tiles to Madeley, his waggon and two men will be out two days, and will cost him 20s.—

the badness of the roads will hardly ever admit of his carrying a ton ; by the canal he might convey the same for 3 s. freight and tonnage, and for half that sum should he have a boat of his own.

“ I cannot omit mentioning once more the vast quantities of corn, and all sorts of grain from the counties of Stafford, Salop, and Chester, that will be sent to all parts on this canal, to supply as well as foreign markets ; and from these three counties, bordering on or within six miles of the canal we may suppose not less than 15,000 tons will be carried yearly 20 miles on the canal, reckoning 1 s. 6 d. tonnage, and 1 s. 6 d. more for going 20 miles on the navigation, will amount to a considerable income.

“ I will only mention one more considerable article which will always be conveyed along this canal. I mean timber for houses, and also for ship-building, as within six miles of this canal, in Staffordshire and Shropshire, they may vie with all the rest of the kingdom (taking the same compass) for the largeness of the oak trees fit for keels and building large ships. These may be conveyed at least 60 miles on this canal. From the centre we will suppose 10,000 tons and upwards of this timber will pass 30 miles on this navigation, which, at 1 s. 6 d. per ton, will amount to 2253 l. which will be an income that will accrue between Bristol and Liverpool only, but much more if to Hull.

“ I must here observe, that all the trade, manufactures, and merchandise I have hitherto mentioned, are subsisting between Liverpool and Bristol only. I have not taken notice of any trade from Stafford down by Burton to Wilden Ferry, which is 43 miles.

It is a great country for timber, but there is no very great manufacture any where within six miles of the canal, except I mention Burton ale, which is sent to all parts, carrying on a large trade in that commodity alone. A great quantity of malt would be carried thirty or forty miles on the canal, which would greatly increase the income. In case that Birmingham and Wolverhampton, Litchfield and Tamworth, should ever have cuts made to communicate with this canal," (which since the publication of the pamphlet from whence these extracts are made have been accomplished) "the chief of the tonnage of this part would be from various manufactured goods which they ship at Hull to send abroad. Birmingham might have a canal made to go by Litchfield, and fall in with this at King's Bromley Common, which would be 24 miles. Wolverhampton might have a cut, either down by the Penk river, to fall into the junction of the Penk and Sow, or by Hedgeford Pool, down that valley, to fall in by Rudgeley forge; which of the two is most feasible I cannot determine, the first being 16 miles, and the falls great; the latter 18 miles, and the falls much less.

"I must here take notice how easy the canal between Tern-bridge and Batchacre Grange to Bridgeford will be completed, as no country can be more properly adapted for a navigation, being so well supplied with water, and a little below Batchacre Grange there is eight miles without a lock. As I have before mentioned the size of the boats for the canal, I must give some description of the size of the locks, the quantity of water they receive and discharge, and then shew the quantity of water in

store in the reservoirs, where they are to be made, and how many boats that quantity of water will suffer to go through each lock in a day. The canal is proposed to be nine yards broad at the surface of the water, six yards broad at the bottom, and five feet deep in water: the sides to be an angle of 45 degrees. The boats are to be 50 feet long, and 12 feet broad, and carry 80 tons, and draw three feet water when loaded, with one mast to lower down upon deck, a main-sail, fore-sail, and jib, and a spare square-sail to hoist up before the wind: decked from stem to stern, or as occasion may require. One horse will draw these vessels at the rate of five or six miles an hour, and they will bear the tideway either to Bristol, Liverpool, or Hull, which saves them the trouble of re-shipping.

“ The locks are to be 10 feet high, 60 feet long, and 13 feet broad: the surface of water running in each time the lock is opened, will be the height of the lock, 10 feet; so that the waste of water at the locks amounts to 288.8 cubic yards or 200 tons.

“ Now we are to see how many times that quantity is contained in the reservoirs; and the summit is the first place to be considered, which is in the valley below Offley Park. There is now a large reservoir of water at Offley Park mills, which may be made 12 acres surface, and 10 feet deep, which will contain 193580.6 cubic yards. There is also a large sheet of water called Cockmere, 35 acres, which may be pounded up 10 feet higher, both which would amply supply the west course, as at Batchacre Grange you have a reservoir of 80 acres of water, which, at five feet deep, contains 645074 cubic yards; on the sides of which the intended

canal is to go, which, without further supply, would be fully sufficient for the locks as far as Severn, and suffer a vessel to pass through the locks 56 times each day. Numbers of brooks and rivers may be pounded up any where the whole way down to Tern-bridge on the Severn. There is no country so well supplied with water for frequent passage as this between Tern-bridge and Bridgeford. We will now see how the east course may be supplied, viz. from the summit below Offley Park to Bridgeford. Cockmere, as before observed, is a piece of water of 35 acres, which is now higher than the summit of the canal, and may be pounded up to any height; a yard or two without any damage, as the banks on each side are very high, and the valley above very quick in the descent and narrow; so that the expense of having a surface of water of 35 acres, and 10 feet deep, which would contain 564610.2 cubic yards of water, and fill the locks 1950 times, would be very small. Many places all the way down to Bridgeford might be made for reservoirs, which would supply the locks down by the Trent to Wilden Ferry, at no great charge or trouble. We will next consider what quantity of water we shall have to supply the north-west course of the canal, between the summit at Madeley Park and Winsford-bridge; and therefore observe, that a large sheet of water of 40 acres, and and five feet deep at a mean, which will contain 322537.5 cubic yards of water, may be made above the north-west course, and suffer 1119 boats to pass each 40 days. As the current coming in, taking the summer through, will be able in that time to fill the same again, the head of this rivulet here would be sufficient for such supply at any time, and suffer 28

boats to pass each day. The rivulet that rises in the Can Bogs in Madeley Park, by making a dam at Charlton, would be easily made to supply the south-east course to Bridgeford.

“ The great matter is to have water at the head or summit of your canal sufficient for a quick passage : since if that is wanting your navigation is useless.

“ I must here observe, that the reservoir at Madeley Park will be full as lavish of its waters, and will be able to supply as quick a passage as that from Offley Park summit to Tern-bridge or Bridgeford.

“ There is no river that has such a length of navigation (in England) as the Severn : you may navigate a vessel of fifty tons, and not a lock the whole way, 200 miles up to Welch Pool, except in an excessive drought, which does not happen every year, and, when it does, not above a month, seldom two ; but upon a small quantity of rain falling will give water sufficient, There are some few fords or shallows below Tern-bridge, which may be easily remedied. Between Tern-bridge and Bridgenorth, which is 14 miles, there are several shallows that go by various names ; but at any of which a well-constructed vessel, carrying 30 tons, is seldom or ever impeded, except at the three following, viz. the Lake, the Worps, and the Lydes. They all lie within the compass of a mile, and when the vessels come there, they take out about two tons to lighten them, and put them into smaller boats, and re-load again at one mile's end, without any extra expense to the person who sends the goods. These fords are partly opposite to Madeley wood. Between Bridgenorth and Bewdley are also shallows ; but they impede vessels of that burden in a very trifling degree,

except two near Bewdley. Below Bewdley to Redstone Ferry are two more shallows, as bad as any of the former.

“ The reader will please to observe, that the lowest water that ever happens in the driest summer is never less than 18 inches, which is sufficient to carry vessels of 16 or 17 tons burthen at any time.

“ The river Severn is a free navigation, and no tonnage upon it, and the number of persons navigating upon it live at various places, and are not connected in a body sufficient to agree to remove these shallows, or to apply to parliament to be incorporated for such a purpose; and, what is every body's business is nobody's; therefore the reader must not be surprised why these shallows have not been removed; nor let him be more astonished, to be informed that they may be remedied and deepened, so as to admit vessels of 50 tons burthen, in the driest summers, for the trifling sum of 40*l.* each; and still these obstacles remain neglected and unnoticed. I would therefore propose, that the proprietors of the Tern-bridge navigation here intended, should have a power vested in them to lay out any sum not exceeding 1000*l.* upon the river Severn, from Shrewsbury to Worcester, in order to make the navigation of the Severn more commodious by deepening, scouring, and widening the river and the banks thereof. As also a power should be given by act of parliament for the towing, hauling, and drawing of vessels and boats, by horses as well as men on both sides of the river Severn. If the above requisites should ever be obtained, the Severn would be then the most complete navigable river in the kingdom.



“ Though in the former part of this treatise I have pointed out a method, whereby this grand canal scheme may be executed, and have proposed the same to be done by a company of proprietors ; yet I cannot help thinking, and strongly recommending, that government should undertake a thing of such magnitude and material consequence to this nation, as the joining the three great ports of Bristol, Liverpool, and Hull together by a navigable canal, as it ought to be executed in a noble manner, and not intrusted to the interested and narrow-minded notions of the upstarts of every little trading town, whose sole view will be their own good at the costs of others. The design was great, and it were to be wished that the execution was such that the canal may be made of a size, width, and depth as will admit at all times such vessels as will bear navigating through the tides way in the channels.

“ I have also, in the former part of this treatise (continues my author), described the canal as proper to be carried down to Wilden in Derbyshire ; yet upon mature consideration, and having informed myself of many difficulties that may arise on account of the floods from the river Dove, which would greatly impede the execution of the navigation, by being obliged to raise a high bank along the meadows for almost three miles, with arches every hundred yards for the floods from the river Dove to pass through ; I am, for these and many other reasons, inclined to think that the canal ought to enter the Trent at Burton, as there is a navigation made by authority of parliament, and which is reported to be no very bad one. It is granted to the earl of Uxbridge, and is now enjoyed by his lessees. The tonnage is very

reasonable, and large vessels may navigate thereon. From Burton to Wilden is 16 miles, and the water in the river Trent is deeper from Burton to Wilden, than it is below Wilden to Gainsborough, as there are more shallows in proportion below Wilden Ferry to Gainsborough than between Burton and Wilden (this I shall explain further on at a proper time). Between the latter, vessels from 30 to 40 tons may navigate, which are seldom or never impeded. From Burton to Gainsborough is about 110 miles, and boats are frequently known to perform that voyage, and back to Burton in eight days. Tonnage on the Burton navigation is very moderate; nor can it be considered in any shape as a monopoly, as the tonnage of that river from Burton to Wilden is no more than 3*d*. From these, and several other arguments, I am induced to think that it would save a considerable sum of money, by having the canal to enter at Burton, I dare say, at least 10,000*l*. to the proprietors; but as I have pointed out the other, I must leave it to the consideration of those concerned. But in case the canal should be made as far as Wilden, I think at least that the proprietors who have been at the expense of the Burton navigation, should have as many shares in it as their present debt amounts to, or in some measure some part of the tolls arising from the same length of the canal, as is opposite to their navigation, should be appropriated for the payment of the principal or debt lodged upon the old navigation. I must however continue to think, that it would be no great detriment to the public were the canal to terminate at Burton; and for my own part would rather wish it, provided the same was to be put under the same directions, regu-

lations, and orders, as by authority of act of parliament the present canal is intended to be ; and that the present lessees, when under such restrictions, might be concerned as proprietors in the same.

“ It is not requisite to my present purpose, that I should enter into the minutiae of every article in the succeeding table ; most of which have been before mentioned, either as produce, manufactures, or commerce. I shall now shew the gross sum the canal will produce, all expenses paid.

“ It will appear, when all circumstances are duly considered, that the income of 15,285*l.* 18*s.* which is computed as accruing to the proprietors of the navigation, is, in fact, only a third part of the real profits of the tonnage of goods ; but as it serves the purpose of proving, that the income of this canal will pay the expense of making it in a few years after it is completed, and of shewing to parliament, that the taking the same into consideration is worthy the notice of the legislature to pass an act for that purpose as a public good, and not only a local but a national benefit.

“ I will now proceed to shew what sum of money the proprietors will be enabled to borrow, paying five per cent. for the same from the time the sums are wanted, for the execution of the design. The income (being only estimated as a third of the really expected profits) amounts to 15,285*l.* 18*s.* which will enable them to borrow the sum of 300,000*l.* leaving the sum of 285*l.* 18*s.* for repairs of locks, and other accidents, and salaries to officers and servants ; but if the income should in a few years amount 45,857*l.* 14*s.* it will enable them to borrow the sum of 900,000*l.* leaving the 857*l.* 14*s.*

for repairs of locks, and salaries to officers and servants. We will now come to the estimate of the expense of making and completing the canal; and as I have only before reckoned the income as chiefly accruing between Bristol and Liverpool, and very little on the part of the canal leading to Burton and Wilden Ferry, I will therefore first mention the sum that will be required for making and completing the canal from Tern-bridge, on the Severn, by Batchacre Grange to Bridgeford in the county of Stafford, from thence by Madeley Park in the said county, to Windsford-bridge in the county of Chester, to communicate from thence with the river Mersey by the river Weaver.

“ The sum required will amount to 68,000 *l.* including all things during the execution of the work; the interest of part of which must be paid out of the fund until profits accrue, which may happen within three years, sufficient to pay the whole interest, and replace the deduction out of the principal; and as the canal may be completed in four or five years between Bristol and Liverpool, the principal in six years after might be paid off, and 22,000 *l.* over the last year to pay off the interest of the sum in hand, each year decreasing gradually for six years, the account will stand thus:

“ The certain income of the canal is 15,285 *l.* 18 *s.* which, at five per cent. enables them to borrow in the whole 300,000 *l.*

“ The expense of making the canal from Tern-bridge to Winsford-bridge, 68,000 *l.* so that if the proprietors only borrow 68,000 *l.* the interest required to pay for that sum will be 3,400 *l.* there remain then 11,600 *l.* to be divided among the pro-

prietors yearly (over and above the five per cent.) as profits accruing from the canal, which will be an income of 20 *l.* per cent. to each proprietor, exclusive of the 285 *l.* 18 *s.* which is allowed for unforeseen accidents, and yearly salaries to officers and servants. Surely all persons will be induced to lodge their money in this fund, not only to lend their assistance to so public a good, but for the satisfaction of receiving yearly 20 *l.* interest for his 100 *l.* so lent, and the principal to be paid in a few years, or at any time they choose it, and thereby securing a certain annual estate for themselves, and their heirs for ever; and let each person consider, that in 10 or 12 years the income may amount to 45,000 *l.* per annum. How great and immense will the profits be to the proprietors! They must be such as to make every one repent that he had not the foresight and prudence to lodge his whole fortune in so glorious an undertaking.

“ I will now proceed to shew the expense of making and completing that part of the canal from Bridgeford, in the county of Stafford, by Stafford, Wolesly-bridge, and Bishton, in the said county; thence by Burton to Wilden Ferry, on the river Trent, in the county of Derby. The income of that part of the canal (which I shall term the eastern branch) is not very considerable, but will chiefly arise from the carriage of corn and all sorts of grain towards Wilden Ferry; and the carriage from Wilden back will be chiefly in London goods brought to Hull by sea, and along this cut to the inland towns east of Stafford, being not many in number, as most of the country about Stafford will be supplied from Bristol or Liverpool. The distance from

Bridgeford to Wilden Ferry is 43 miles; and the income to the proprietors may every year amount to the sum 2617 *l.* 10*s.* for tonnage of goods passing on the canal: the proprietors will therefore be enabled to borrow at five per cent. as before mentioned, the sum of 52,350 *l.* and the estimate of the expense of making and completing the said eastern branch will amount to the sum of 48,000 *l.* including all things necessary. So that if the proprietors borrow the said sum of 52,350 *l.* the interest at five per cent. will be 2400 *l.* and there will remain the sum of 217 *l.* 10*s.* to be divided among the proprietors as the profits of the canal; which will be more than five per cent. per annum. I must also add, that this income will greatly and immensely increase whenever Wolverhampton and Birmingham shall have cuts into it as before described; and which are now, and have been for many years, completed.

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“ The estimate of making the Canal from or near Tern-Bridge, on the River Severn, in the county of Salop, to the Junction at Bridgeford, in the County of Stafford: the Distance being  $31\frac{1}{4}$  Miles. Rise 136 Feet 9 Inches to the summit. Fall to Bridgeford-Bridge 54 Feet 8 Inches :—

IN the intended course of this canal, between the upper end of Tunstall Moors (in the valley below Offley Park), and its junction with a brook near to Cockmere: the distance being a mile and a half: the highest point of land being 25

feet high. To reduce this to a level 18 yards in width, (being the breadth of the towing-path, canal, and drains) must be removed at a mean 198015.84 cubic yards, which, at 3 *d.* per yard, will amount to. . . . . £2,475 3 11½

The canal is proposed to be 9 yards broad at the surface of the water, and 6 yards broad at the bottom. These dimensions, in 31¼ miles, will produce 687637.5 cubic yards, to be removed, which, at 3 *d.* per yard, will amount to. . . . . 8,595 9 4½

The canal, towing-paths, and drains, being 18 yards in breadth, in 31¼ miles (deducting one mile for waste land), there will be 199 A. 1 R. 20 P. to purchase which, at 15*l.* per acre at a mean, will amount to. . . . . 2,985 0 0

Twenty road bridges, at 80*l.* each, will be. . . . . 1,600 0 0

Fifteen water bridges, at 50*l.* each, will be. . . . . 750 0 0

Making towing-paths, drains, gates, and fencing, at 10*l.* per mile. . . . . 312 10 0

From the highest point of land below Offley Park to the river Severn (the fall being 136 feet 9 inches), supposing a lock necessary for every fall of 10 feet, 13 locks will be required, which, at 450*l.* per lock, will amount to. . . . . 5,850 0 0

From the said highest point to Bridgeford-bridge (the falls being

54 feet 8 inches), in the abovementioned proportion, there must be at least five locks, which at 450*l.* each, will amount to ..... £2,250 0 0

Two funnels between each lock, making 34 in number, at 10*l.* each, will amount to ..... 340 0 0

Five per cent. upon the whole for unforeseen accidents. .... 1,414 3 0

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£ 26,572 6 4

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To make the three shallows between Tern-bridge and Redstone Ferry, and the two below on the river Severn, to a proper depth of water fit to carry a vessel of 30 tons, in the driest summers, at 40*l.* each, amounts to ..... £ 200 0 0

N. B The exact depth of the shallows in dry summers, and necessary removal, is before mentioned.



"The Estimate of the Expense of making the Junction above Bridgeford-Bridge, in the County of Stafford, to Winsford-Bridge, in the County of Chester. The Distance  $32\frac{1}{4}$  Miles. Rise to the Summit 100 Feet  $3\frac{1}{4}$  Inches. Reduced Fall to Winsford-Bridge, 284 Feet 1 Inch :—

. IN the intended course of this canal, between the lower end of Charlton Moss, and about half a mile below Snape, the distance being one mile and half, the highest summit of land is an elevation of 25 feet. To reduce this to a level, 18 yards in breadth, which is the breadth of the canal, towing-paths, and drains, must be removed at a mean 19801584 cubic yards, which, at 3*d.* per yard, amounts to . . . . . £2,475 3 11½

The canal is proposed to be nine yards broad at the surface of the water, and six at the bottom, and five feet deep. These dimensions, in  $32\frac{1}{4}$  miles, will produce 72011.8 cubic yards of earth to be removed, which, at 3*d.* per yard, will cost . . . 9,002 13 0

The canal, towing-paths, and drains, at  $32\frac{1}{4}$  miles, there will be to be purchased 214 acres, which, at 20*l.* an acre, will amount to . . . 4,287 5 2½

Twenty-two road bridges, at 80*l.* each . . . . . 1,760 0 0

Three water bridges, at 50*l.* each . . . 150 0 0

Making towing-paths, back-drains, gates, and fencing, at 10 *l.* per mile, amounts to ..... £ 330 0 0

From the junction above Bridgeford, to the summit in Madeley Park, 100 feet 3½ inches, supposing a lock at every 10 feet necessary, it will require ten locks, at 450 *l.* each, ..... 4,500 0 0

From the above summit to Winsford-bridge, 284 feet, 1 inch fall; and supposing as above, it will want 29 locks, at 450 *l.* each, ..... 12,600 0 0

Two funnels between each lock, will be 76, at 10 *l.* each, ..... 760 0 0

Five per cent. upon the whole for unforeseen accidents ..... 1,793 5 0

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Total ... £ 37,658 7 2

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“The Estimate of making the Canal from the Junction of the River Sow, above Bridgeford to Burton, in the County of Stafford; and thence to Wilden Ferry, the Distance being 27 Miles to Burton, and 16 from thence to Wilden Ferry. Fall to Wilden Ferry is 209 Feet 4 Inches :—

THE canal is to be nine yards broad at the surface of the water, six yards at the bottom, and five feet deep : these dimensions in 43 miles will produce 945621.6 cubic

yards, which, to remove, at 3*d.* per  
yard, amounts to ..... £11,820 5 4

The canal, towing-paths, and  
drains, 18 yards wide, and 43 miles  
long, there will be 281 acres and 2  
roods, which, at 30*l.* per acre,  
comes to ..... 8,445 0 0

From the above junction to Wil-  
den Ferry, is 209 feet 4 inches fall,  
which will require a lock every 10  
feet, will be 21 locks, at 450*l.*  
each, ..... 9,450 0 0

Two funnels between each lock  
are required, which make 52, at  
10*l.* each, and amount to ..... 520 0 0

Thirty-six road bridges, at 80*l.*  
each, ..... 2,880 0 0

Seven water bridges, at 50*l.*  
each, ..... 350 0 0

Towing-paths, back drains, and  
fencing, at 10*l.* per mile, for 43  
miles, is ..... 430 0 0

Five per cent. upon the whole  
for unforeseen accidents ..... 1,677 5 0

Total £ 35,572 10 4

Additional charges in banking for three miles, and  
making arches against the floods in Dove meadows,  
not included in the above account, 3000*l.*

In case the canal should be carried no further than  
Burton, and enter the river Trent there, it would only  
cost 23,801*l.* 4*s.* 1*d.*

By carrying the canal only to Burton, to enter the Trent there, the money saved to the public would be 11,771*l.* 5*s.* 9*d.*"

So far my author, whose plan was rejected. I shall now proceed to describe the plan laid down by Mr. Brindley, which plan was approved and immediately carried into execution with the greatest dispatch and success.

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*Plan of the Canal proposed by Mr. Brindley.*

I shall now proceed to describe the route of the other canal, from the river Mersey to the rivers Trent and Severn, planned and executed by Mr. Brindley, engineer to the Duke of Bridgewater, with its dimensions, the expense of completing it, and the reasons which induced the proprietors to prefer Mr. Brindley's plan to that of which I have just given an account. I shall also briefly enumerate the advantages to be expected from it to the produce and manufactures of the counties it passes through.

At a very numerous meeting of land-owners, gentlemen, traders, and manufacturers, held at Wolseley-bridge in Staffordshire, on the 30th of December 1765, which meeting was attended by Earl Gower, now Marquis of Stafford, lord lieutenant of the county, and the members in parliament for the county, and those for the city of Litchfield, and towns of Newcastle-under-Line and Clithero, as also by a great number of the gentlemen of that and the neighbouring counties, it was unanimously resolved to apply to parliament for leave to bring in a bill for making a navigable canal from Wilden, in the

county of Derby, through Staffordshire, to the river Mersey.

Lord Gower opened the meeting with a very sensible and elegant speech ; in which he expressed his great satisfaction in seeing so many gentlemen met on so great a design. He declared, that he looked upon it as of the utmost consequence to the manufacturers of that and the adjacent counties, and to the kingdom in general ; that ever since he had heard of the scheme, it had been his determination to support it with all his interest, as well provincial as political ; for he was satisfied, that the landed and trading interest were so far from being incompatible, that they were the mutual support of each other ; and therefore his Lordship hoped that every gentleman present would concur with him in endeavouring to carry so noble and so useful a design into execution. Mr. Brindley was then called in, and examined, and the heads of the plan were also produced and agreed to with very little alteration, and the necessary steps taken for the intended application to parliament.

It was then resolved, That it will be most convenient for the execution of this undertaking, if the expenses of making and completing the navigation, which have been computed at 101,000*l.* were to be distributed into 505 shares, and raised by subscription ; and that no one person should have above 20 shares ; and the money to be advanced by each subscriber in equal proportions as wanted ; and the shares made transferable by a form in the act.

That a subscription be opened for a fund to defray the necessary expenses in obtaining the act ; and

that the money there subscribed shall, after passing the act, be repaid to such as shall not be subscribers, and allowed to such as shall be subscribers, in part of payment of their shares.

That a subscription be opened for the money which shall be wanted for making and completing the said navigation ; and that 14 days be allowed to complete the said subscription ; and that subscriptions may be entered with Messrs.

at Liverpool, Manchester, Congleton, Newcastle-under-Line, Stratford, Litchfield, Birmingham, Tamworth, Wolverhampton, Walsal, Dudley, Burton, Derby, Nottingham, Newark, Gainsborough, and Hull, where books will be kept for that purpose ; and an account is desired to be transmitted from each gentleman, of the subscriptions at each place, at the end of 14 days, to Mr. Sparrow in Newcastle ; and if the subscription shall not then be complete, 14 days more to be allowed.

That if the shares to be subscribed after this day shall exceed the number which shall remain unsubscribed this day, they shall be reduced in proportion.

That it will be convenient in the execution of this undertaking, if the subscribers were to have votes, according to their number of shares, in the annual choice of a proper number of directors, to be limited in the act, who shall have the management and inspection of the work, and to have commissioners named in the act to determine all controversies and disputes which may arise.

That proper provision should be inserted in the act, for making full satisfaction to the land-owners and their tenants for all the lands that shall be

taken for the use of such navigation, and for all damages, both present and future, which they may sustain thereby, and for the giving all proper conveniencies to such land-owners, and their tenants: the same to be determined by commissioners or juries, where necessary, in the usual manner.

That it be proposed for the consideration of parliament, that a proper and reasonable tonnage be fixed by the act, in proportion to the distance that each and every vessel may have to pass on the canal; and also that the subscribers may be paid five per cent. for the respective sums advanced from the time of their paying in the same, till the whole communication shall be completed; and from that time, that they may receive their profits, according to their shares; and that the subscribers be permitted to vote by proxy.

That no toll be taken for stone, gravel, or other materials, for repairing the roads: nor for dung, soil, or marl; nor more than half tolls for lime for mortar.

Before I proceed to the particular advantages to be expected from this canal, it may not be improper to state the reasons why a canal is to be preferred to a river navigation, which are many and important. The shortness of the voyage on the former, which is protracted on the latter by the winding course of the stream; the absence of currents, which, in rivers, impede the upward navigation more than they assist the downward\*, and hourly undermine and wear

\* This advantage can hardly any where appear in a more full and striking light, than at Barton-bridge, in Lancashire; where we may, at the same time, see seven or eight stout fellows labouring like slaves to drag a boat slowly up the river Irwell; and one

away the banks ; the security from the mischief and delay occasioned by floods ; the easier draught for the horses, as the boats in a canal move nearer the towing-path ; and the advantage of choosing high ground for the locks ; while in the other case the situation of them must be regulated only by the accidental shallows of the rivers—are all circumstances greatly in favour of canals ; and especially the last : for as in river navigations the lock must frequently be erected on low lands, the neighbouring meadows are thereby often rendered damp and swampy ; while in canal navigations this disadvantage is avoided.

This canal is designed to fall into the Trent at Wilden, rather than at Burton, to avoid the shallows which greatly interrupt the navigation on that river. At Harecastle, the highest part in the course of the canal, from whence the water falls north and south, it will pass above a mile under ground ; by which means fewer locks will be necessary, and more water supplied from the coal mines in that country ; and the whole length of it, with its branches, will be upwards of 100 miles.

The canal, and vessels to navigate thereon, are to be constructed on the plan found most eligible, from various experiments made on the Duke of Bridgewater's navigations. From these experiments, his excellent engineer, Mr. Brindley, hath proposed to complete this canal as far north as Harecastle, purchase the land, erect locks, make towing-paths, build bridges, and defray every expense, except obtaining the act of parliament, for 700 *l.* a mile. To

horse drawing two or three boats on the canal, which is carried over the river at this place like a magnificent Roman aqueduct, 38 feet above the level of the water below.



cut through Harecastle, it is supposed, will cost 10,000 *l.* and the remainder of the canal 1000 *l.* a mile. He proposes to make the canal 12 feet wide at the bottom, and three feet deep in general, but at the fords only 30 inches, and in common to supply it with a quantity of water just sufficient for the navigation, have no stream, and be like those in Holland.

The boats are to be 70 feet long, six feet wide, to draw 30 inches water when laden, and to carry 20 tons burden. They are to be so constructed as to be able to sail with either end foremost, by removing the rudder, and to cost about 30 *l.* each.

There is to be a man and a boy to each boat, which one horse will draw with ease along the canal; but will be able to draw three of them.

It is proposed to raise the money by subscription in lots or shares of 200 *l.* each. No person to subscribe for more than 20 shares. The tonnage to be fixed by act of parliament, and vested in the subscribers as a security for their money. The company to be under the inspection of commissioners, as in most other navigation acts. The shares to be made transferable in an easy manner, like government securities. The navigation to be free and open to all persons on paying the tonnage fixed by law; and land-owners to have liberty to erect warehouses and wharfs on the banks or sides of the navigation.

*Particular Advantages of the intended Canal.*

The advantages arising from cheapness of carriage, and easy communication between the distant parts of a country and the manufacturing towns and sea-ports reciprocally, are so extensive and so complicated,

that it is impossible to reduce them to any exact estimation. If we would attempt to estimate them at all, it will be necessary to discover, as near as we can, how much the price of carriage is likely to be diminished, and what quantities and kinds of goods will probably be conveyed by this navigation.

The course of the canal is from the Mersey, at Runcorn Gap, into the Duke of Bridgewater's canal, by Haulton; thence up to Preston Brook, to near Northwich; and thence to Middlewich, Warrington, Elton, Sandbach, Lawton in Cheshire, Harecastle, Burslem, Newcastle, Shelton, Stoke, Fenton, Trentham, Barleston, Darleston, Stone, Ashton, Sandon, Shutborough, Haywood, Bishton, Wolseley, Rudgley, Wichnor, Drakelow, Burton, in the county of Stafford, Egginton, Weston, Aston; and thence into the Trent at Wilden in Derbyshire.

The price of land carriage, in the neighbourhood of the canal, is upon an average about 9s. per ton for 10 miles. It is supposed that the tonnage upon the canal, for the same distance, will be about 2s. and the freight not above 6d. more, in all 2s. 6d. per ton; so that near three-fourths of the carriage will be saved to the public. And the difference between land and water carriage in other places confirms the justness of this conclusion. Land carriage, for instance, between Manchester and Liverpool, which is about 38 miles, costs 40s. per ton; water carriage by the Duke of Bridgewater's canal only 6s. 8d., one way, and 10s. the other: suppose 9s. upon an average; and the saving by the navigation is about three-fourths of land carriage.

If we suppose the saving to be only 6s. in 9s. which is a moderate computation, this circumstance alone

will not only enable land-owners, manufacturers, and merchants to convey many articles to markets where they never could have borne the expense of land-carriage; but will also bring into use many natural productions, such as coals, stone of various sorts, timber, iron ore, alabaster, &c. &c. which from their unfavourable situations never could have been employed.

To give some idea of the advantages, we must endeavour to enumerate the chief sources of employment for the intended navigation; and these may be considered under the three following heads: 1st. Natural productions of the countries that lie near the canal. 2d. Cultivated commodities and manufactures. 3d. Imported raw materials and general commerce.

From Northwich to Lawton, there lies a vast bed of rock salt, about 40 yards thick, which, besides being purified and crystallized for home consumption and exportation, as will be mentioned in its proper place, might be made great use of in agriculture, and probably in metallurgy, and several of the mechanic arts, if any method could be discovered of granting the liberty of using it with safety to the revenue.

There is a mountain called Molecop, near Lawton, that contains four useful different kinds of stone. 1st. Mill-stones, of an excellent quality, which are now carried by land above 100 miles, and to all parts of the intended navigation. 2d. A good limestone. 3d. A fine free-stone. 4th. Grinding stones of different sorts.

Near Wolseley-bridge, and also a mile below Burton, a free-stone is found on the banks of the

river Trent, excellent for its firmness and colour : some parts of which seem not inferior to that of Portland or Roch Abbey.

A mile from Rudgley, a blazing kind of coal, called canel, and other coals are found belonging to the Earl of Uxbridge. The lower stratum of these mines is said to be very valuable ; and it is apprehended a navigable sough might be carried from the new canal into the heart of them, in the manner of the Duke of Bridgewater's in Lancashire : and that this would lie them dry, the want of which is the present obstacle to their being worked, and at the same time convey the coals into the new canal, to the great advantage of the noble proprietor, and the neighbouring country.

Near that part of the river Trent, where the canal is to terminate, arises a vast mountain of lime-stone ; on which the village of Breden in Leicestershire is situated. At Tickenhall in Derbyshire, not far from the last-mentioned place, there are also quarries of lime-stones ; and at Barrow in Leicestershire they burn an excellent kind of lime for building, which is conveyed to places at a great distance by land, every way ; and lime is much wanted through the whole course of the canal, both for building and cultivation.

A few miles lower, at Clay Hill, an elegant, fine, firm alabaster is found, proper either for stucco or sculpture.

Not many miles from the Trent, near the river Soar, in Leicestershire, are the noted quarries of Swithland slate, a beautiful and durable covering for houses, and prodigious rocks of that kind of

grey porphyry which is brought from Scotland to pave the streets of London and Westminster.

A great quantity of marl will be thrown out in making of this canal; and may besides be found in many places so near the banks as to be delivered from the spade into the boats, which will greatly contribute to the improvement of such land as stands in need of this kind of manure. Other manures will also be easily procured from large towns on reasonable terms for back carriage; and as it is intended to exempt manure from any charge of tonnage, these advantages, together with the lime mentioned before, will double the produce and value of much land near the canal.

Several parts of the country, within a few miles of the canal, yield great quantities of ore, called iron-stone, proper for making cold short iron; and which, when mixed with the red ore from Cumberland, makes the best kind of tough iron, called merchantable iron. The iron-stone of this country is likewise so necessary for working the ore in the north, that even the great expense of land carriage has not prevented large quantities of it from being conveyed that way by the river Weaver to be shipped for Cumberland; and the ore from the north has been brought into this country under the like inconveniencies. It seems, therefore, highly probable that the intended canal will occasion the sending much greater quantities of iron-stone into the north, and the receiving more red mine back in return, and thereby greatly increase the intercourse between these two parts of the kingdom, to their mutual advantage.

Not only these natural productions that are to be found on the banks of the intended canal, but many of those from distant parts of the country it is to pass through, will have their value and consumption greatly increased by this easy and cheap conveyance. Of this number are lead, copper, calamine, marble, rotten stone, raddle, white clay, ochres, &c. and many other articles will probably become useful to society, which at present lie unmolested in their native beds.

From natural productions we may proceed to the consideration of those that are cultivated and manufactured ; and that which deserves our first attention on this head is corn : but this subject has been already sufficiently entered into in the description of the preceding canal. I shall therefore only observe that, in times of plenty, the land-owners and farmers near the canal will receive great benefit from the easy exportation of grain of all kinds. In times of scarcity, the whole country will be relieved by a seasonable importation ; and thus the blessings of Providence be more equally distributed, and an artificial dearth rendered almost impossible. How ineffectual would be the attempt of the most powerful monopolizer in such a country as China or Holland, where plenty can be thrown into any market from all parts by means of navigable canals !

Another cultivated article of great importance is timber of all kinds, oak especially, of which there are many large woods near the course of the intended canal, that, for want of a proper conveyance to seaport towns, where timber is much wanted for ship-building, are sold in the neighbourhood at a low price. Any method of conveying so bulky as

article to places of consumption at an easy expense, will greatly encourage the growth of it, and help to repair that decrease of it in this nation, which is found to be an alarming circumstance.

Cord-wood to make charcoal for the iron works, oak-bark for tanners, and woad, madder, and other articles, which may become the object of cultivation, will be carried at a cheap rate on the canal, to the mutual advantage of the proprietor and consumer. Wool, hides, tallow, and provisions of various kinds, will become more beneficial to the owners, by the advantage of an easy conveyance to where they are consumed or manufactured.

As this canal will go through the middle of Cheshire, so famous for the excellent cheese it produces, the advantages arising to it from the dairies will be very considerable, as many hundred tons of this article are annually carried by land above 40 miles to Willington in Derbyshire, to be shipped for London and other distant markets, which will for the future be sent by water all the way to Hull and Liverpool, at a very moderate expense.

From the Witches in Cheshire manufactured salt is carried on horseback to almost all parts of Staffordshire, Derbyshire, Yorkshire, Leicestershire, Nottinghamshire, and Lincolnshire, to which places it will gain much cheaper access by means of this intended navigation. And so great is the home consumption of this article, that from the salt-works of Northwich only, a duty of 67,000*l.* has been paid yearly into the exchequer : at Northwich and Winsford are annually made about 24,000 tons.

The town of Burslem, and villages of Stoke, Hanley Green, Lane-end, and Lane-delf, are em-

ployed in manufacturing various kinds of stone and earthen wares, which are carried at a great expense to all parts of the kingdom, and exported to America, and the West Indies, and to almost every part of Europe; but the ware that is sent to Hull is now carried by land upwards of 30 miles to Willington; and that sent to Liverpool, 20 miles to Winsford. The burthen of so expensive a land carriage to Winsford and Willington, and the uncertainty of the navigation from those places to Frodsham in Cheshire, and to Wilden in Derbyshire, occasioned by the floods in winter, and the shallows in summer, are more than these low priced manufactures can bear; and without some such relief as this canal which is under consideration, our principal potteries must come to speedy ruin, as we have great competitors, both in France and America, where they are pushing that business forward to great advantage.

All the branches of the metallic trades, which are almost innumerable, and carried to any astonishing extent at Birmingham, Wolverhampton, Walsall, Dudley, and other places in the neighbourhood of the intended navigation, must receive advantages from it that cannot at present be estimated or conceived.

We have already mentioned the important circumstance of bringing ores out of the north to mix with those of Staffordshire, by which the iron of that country may be rendered better and cheaper; and to this we may add the having charcoal, lime, and other fluxes brought to the furnaces at a small expense; and likewise the great saving there will be in conveying this heavy article from the forge to the manufacturer by water. These are circumstances which



must contribute to increase the consumption of English iron, and enable the iron masters in that neighbourhood to enter into competition with foreigners, so far as to reduce the price of foreign iron, and upon the whole greatly to benefit both themselves and the manufacturers; and certainly the first object of any manufactory is to furnish it with its raw materials at the lowest price, to accomplish which nothing bears comparison with inland navigation.

By the means of this canal the iron masters will be able to serve the manufacturers better with their materials; and by the same means the manufacturers will be enabled to send their finished goods away much cheaper, and to more markets, by which the consumption and exportation of them cannot fail to greatly increase.

The circumstance of a water conveyance all the way from Birmingham to the ports of Liverpool and Hull, will be a very great and reciprocal advantage to all the three places. The reduction in the price of carriage, which takes place between Birmingham and Hull, is so great a proportion of the value of guns, nails, and other heavy manufactures of iron, that the exportation of them from thence must be increased beyond estimation.

The fine ale made at Burton-upon-Trent, which is now exported to Germany, Denmark, Sweden, Russia, and the West Indies, may, by means of this intended canal, be exported from Liverpool as well as Hull, to those places where it has become a very considerable article of commerce.

The valuable manufactures of Nottingham, Leicester, and Derby, will find a cheap conveyance to

Liverpool by this navigation ; and the demand for them at that port will be greatly increased.

In the neighbourhood of Burslem, bricks and tiles are made of a blue colour, which are so vitrified as to be harder than stone used in building ; and these articles will find a demand through the whole course of the canal.

Having mentioned the principal natural productions, cultivated commodities and manufactures in the neighbourhood of the intended navigation, we come next to the articles of importation and general commerce.

Great quantities of flint stones used at the potteries in Staffordshire, are brought by sea from the different parts of the coast to Liverpool and Hull ; and the clay used in the white and coloured ware is brought from Devonshire chiefly to Liverpool, and from thence sent up the river Weaver to Winsford in Cheshire. The flints from Hull are sent up the river Trent to Willington in Derbyshire, and from Winsford and Willington they are brought to the works, by land carriage, at a great expense, the one being 20, and the other 38 miles distant from the potteries. And they are likewise subject to the same delay from floods and shallows as mentioned before, to the very great disadvantage of the manufacturers ; and which nothing but a canal navigation can remedy.

Deals and fir timber for building, and mahogany, which are much wanted, and are now very dear in most parts of those counties through which the canal is to pass, owing to the heavy charge of land carriage upon such bulky articles, will be conveyed through the whole extent of this navigation at a

moderate expense, and will become considerable articles of trade.

The numerous manufacturers of Birmingham, and its neighbourhood, will in general receive their raw materials of all kinds much cheaper by this canal; such as copper, calamine, lead, zinc, ivory, and many others.

The merchants of Liverpool and Hull will supply the towns and villages bordering on the canal, with rum, wine, tobacco, sugar, and all kinds of groceries and dying stuffs, at a lower price than they have been used to receive those articles, and with much more safety, cheapness, and expedition. And as these articles are of general consumption, the amount of them must be very considerable, and the benefit to the public very great.

The salt trade will receive very important advantages from the canal, when the navigation of the Weaver may at any time be interrupted, as that article may be forwarded to Liverpool by this conveyance, for the dispatch of those vessels which would otherwise be detained there at a great expense. And any injury the proprietors of the Weaver navigation have to apprehend from it, supposing the navigation should not terminate in that river, must weigh light in the balance of public utility, as their freight chiefly depends on salt and salt-rock from Winsford and Northwich, which at present amounts to about 50,000 tons annually, and will no doubt be still increased. And none of this is likely to come upon the new canal, but when floods or the repairing of locks obstruct the navigation on the river Weaver, because the canal will be some miles distant from Winsford; and though it should come near the

works at Northwich, the disadvantage of loading and unloading, as the canal vessels cannot live in the tide-way, will prevent the salt being sent by them, except on such occasions as before mentioned.

Having considered the principal advantages which the public may expect from the execution of this design, we ought not to forget the pleasures that will arise from it to individuals, especially as taste is so universally cultivated, that our farms are gradually improving into gardens. And here it must be observed and allowed, that to have a lawn terminated by water, with objects passing and repassing upon it, is a finishing of all others the most desirable. And if we add the amusements of a pleasure-boat that may enable us to change the prospect, imagination can scarcely conceive the charming variety of such a landscape. Verdant lawns, waving fields of grain, pleasant groves, sequestered woods, winding streams, regular canals to different towns, orchards whose trees are bending beneath their fruit, large towns and pleasant villages, will all together present to the eye a grateful intermixture of objects, and feast the fancy with ideas equal to the most romantic illusions. If these be the objects of profit and pleasure, it is to be hoped every friend to his country will be cautious of giving weight to trivial inconveniencies, even if they should occur, in opposition to a work of this immense importance, especially at a time when our manufacturers are suffering for want of the usual demands for their goods; and when several rival nations, especially the new States of America, (who have encouraged a great number of our best hands in all branches to emigrate to

them) are exerting every nerve to avail themselves of this opportunity, and are now daily seducing our workmen in every branch of manufacture to leave this country, and contribute to the support of those alarming competitors.

As I am desirous to anticipate every possible objection, in order to refute it as far as my abilities are able, the only remaining one that occurs to me (and which indeed I mentioned before with a promise to obviate it) is, that by the inland navigation the coasting trade, that great nursery of seamen, will be diminished. To this it may be fairly answered, that as this inland navigation will give an opportunity for an easy conveyance of the produce and manufactures of the interior parts of the country to the neighbouring sea-ports, which may from thence be conveyed by sea to the distant parts of the kingdom, as also exported abroad to foreign markets, whence in return other produce and commodities may be brought back, the coasting trade must thereby be greatly promoted; and as this canal will contribute to increase the produce of our farms, it cannot but benefit our present manufactures, and occasion the establishment of new ones; it must also of course enlarge our exports, and, instead of lessening, have, in my opinion, a direct tendency to augment our shipping, and the number consequently of our seamen. But were it otherwise, are not the public advantages which must result from this scheme sufficient to counterbalance the loss of a few hands taken from the coasting trade, even if such a loss could be proved? That, however, seems to me impossible; and shall the lessening of 70 or 80, or

even 100 seamen in the coasting trade, fill up with such terrors and apprehensions as to crush a scheme that may preserve thousands from perishing? Besides, as one man and a boy at least, and in most instances two men and a boy, and very often four or five men, will be employed in each barge, these will acquire some knowledge of the nautical profession; and, having been initiated in the use of oars and sails, will, if wanted for the service of their country, soon make good seamen.

It must also be observed, that when the other parts of this great design are executed, and the principal ports and manufacturing towns of the kingdom come to have a reciprocal inland communication by water, if the coasting trade should be diminished, (though I am certain to the contrary,) the export trade will not only be greatly enlarged, but the internal national commerce will be carried on with much more ease and dispatch; less exposed to expensive and hazardous delays, and perfectly secure in time of war from an enemy.

The other part of this grand design is to have a cut for a canal, of the same dimensions as the former, from out of the grand trunk from the river Trent at Haywood, at the confluence of the river Sow with the Trent, and by Baswick, Acton, Dunston, Penkridge, Brewood, Penford, Tunstall, Tettenhall, Wolverhampton, Treasel, Womborn, Holbeach, Prestwood, Stourton Castle near Stourbridge, Kinfare, Overly, Kidderminster, and into the river Severn, a little below Bewdley. The produce and manufactures of this part being nearly in all respects the same as in the foregoing account of the other part of the canal,

from Liverpool to Hull, it will not be necessary to repeat them. I shall only just observe what a great advantage it will be to the different manufacturers, not only bordering on the canal, but for six or eight miles on each side of it, to have a water conveyance from their own doors, as it were, to the three greatest sea-ports, Bristol, Liverpool, and Hull. Another branch has also been projected (and since completed, of which I shall give a distinct account hereafter), by which this most useful inland navigation is carried into the Thames at Oxford, which will intersect the kingdom by canals into four almost equal parts; the advantages of which are beyond estimation. But I most heartily congratulate my countrymen on their spirit and perseverance to overcome all difficulties for the public good, and the benefit of the nation.

How far these favourable circumstances must contribute to enhance the value of lands, and to promote the wealth and flourishing state of the nation, is referred to the imagination of every intelligent reader. To have the means of conveyance so greatly facilitated, the price of carriage so materially diminished, old manufactures encouraged, and new ones established, estates greatly improved, plenty widely diffused, and the country rendered still more affluent, populous, and secure, are considerations of such weight as cannot fail to interest all benevolent and public-spirited persons in the success of this most important undertaking.

After giving, as I have done, the necessary detail of the particular advantages of this extensive canal, and its intended branches, (now executed) by which a communication will be opened between London,

Bristol, Liverpool, and Hull, it may be thought, and absolutely is necessary to give the different lengths, falls of water, and the number of acres of land lost or destroyed for the use of the canal; these I have given before relative to the former plan. I shall here, however, give them for both navigations, to save the trouble of a reference.

According to the first account, by the author of *The Advantages of Inland Navigation*, the number of acres necessary to be purchased was  $494\frac{1}{2}$  acres.

By Mr. Brindley's plan, which has been executed, the number of acres is only 482. The route of the canal is from Preston Brook in Cheshire, to go into the Duke of Bridgewater's, and to Runcorn, by Great Haywood, to very near Litchfield, and fall into the river Trent at Wilden Ferry. This canal comes through the great hill, called Harecastle, more than a mile under ground; and from great Haywood, by Wolverhampton, into the river Severn, a little below Bewdley; and, from Great Haywood, is called the Wolverhampton canal.

By the first plan the number of miles to be cut in length is 107.

By Mr. Brindley's plan the number of miles to be cut in length is  $139\frac{1}{4}$  and one furlong, and which it may be proper here to name.

|                                                                                 |                  |
|---------------------------------------------------------------------------------|------------------|
| From Preston Brook in Cheshire, to<br>Harecastle in Staffordshire .....         | 30               |
| From Harecastle to Wilden Ferry, in<br>the river Trent .....                    | 63               |
| From Great Haywood in Staffordshire,<br>to the junction of the Birmingham canal | 22 $\frac{1}{4}$ |

---

Carried over .... 115  $\frac{1}{2}$



|                                                                                 |     |               |
|---------------------------------------------------------------------------------|-----|---------------|
| Brought over . . . .                                                            | 115 | $\frac{1}{2}$ |
| From the junction of the Birmingham canal into the Severn, by Bewdley . . . . . | 24  |               |
| <hr/>                                                                           |     |               |
| Total number of miles . . . . .                                                 | 139 | $\frac{1}{2}$ |

By the first plan the falls of water are 730 feet 5 inches.

By Mr. Brindley's plan the falls of water are 1068 feet.

The greatest objection made by the land-owners and farmers to inland navigation, is the loss of land by digging canals, so far as private property is affected; but for this full compensation will be made, as has been mentioned before; the act of parliament, wherever a canal is made, providing for every thing of this nature. Let us only consider what an immense quantity of horse provender is consumed for the support of that land carriage which these canals are sure to reduce; and what a number of acres of land will be brought into cultivation for wheat and barley, which is now wasted for horses. It appears that every horse employed on the road is allowed three pecks of corn per day; and seven quarters of oats on an average is the produce of an acre of land; whence it follows, that the 482 acres of land lost by the canal on Mr. Brindley's plan would keep only 96 horses a year, and consequently, all the horses used in broad-wheel waggon, and in land carriage, on or in the environs of the canals, above 96, are saved to the public; and the land necessary to provide them with provender may be employed to grow wheat and barley, one for bread, and the other for beer, which will also increase the revenue, and will

keep at home great sums of money which for many years have been sent out of the kingdom, for the importation of oats from abroad.

It is on all hands allowed, that it is of the utmost advantage and benefit to the nation, as well as to the land-owners, farmers, and manufacturers, even to the lowest and meanest labourer and mechanic, that these inland navigations should be multiplied and carried to the utmost extent possible. That they have already succeeded beyond expectation is undoubted, and to this success may be attributed all the cuts that have since been made to the different manufacturing towns, and even villages; the number of which is considerable.

I shall now proceed, after giving the description of the plans and routes of the two canals, as I first proposed, to give the observations that have been made for and against the canal falling into the river Weaver at Winsford, rather than into the Duke of Bridgewater's canal at Preston Brook, and so proceeding to Runcorn; and falling at the other end into the Trent at Wilden Ferry, rather than at Burton; and into the Severn at Bewdley, rather than at Tern-bridge, near Shrewsbury\*.

\* Those who would wish to see all the observations and replies, remarks and counter-remarks, facts and reasons, state of facts and reasons, cases, objections, seasonable considerations, and supplement to seasonable considerations, letters, &c. &c. &c. (too tedious to mention, and I may say useless to this history) on these canals, may consult the second part of a pamphlet, or History (as it is called) of Inland Navigation, printed by Lowndes, Fleet-street, in 1769.

**Real solid Reasons to shew that the proposed Canal from the Trent to the Mersey ought not to terminate at Northwich and Burton.**

That the good of a part must always give way to the good of the whole, when they happen to interfere, is one of the most essential principles of civil association ; but it is at all times reasonable, that the great interests of the community should be pursued and supported with as little injury as possible to individuals.

In the course of human affairs, and during the gradual improvement in the arts of life, small things are constantly yielding to greater, bad to good, and good to better, in proportion as human genius expands, and enriches the world with its discoveries ; and it is the unavoidable effect of every new improvement in arts and sciences, to diminish the value of less perfect systems, and works of inferior utility.

But it is a circumstance which gives much pleasure to the friends and promoters of the bill for a canal from the Trent to the Mersey, that very few individuals will suffer by the execution of this great design. And when a work of this great utility is under consideration, it is certainly desirable to have it executed in such a manner as to render it as complete as the nature of the thing will admit.

The object of this design is not local, it is not confined to a few towns or counties, but embraces the great whole. A great and general diminution of the price of land carriage, between the inland counties and sea-ports, will contribute most effectually to increase the cultivation of land, to reduce the price of

our manufactures, and to give us a superiority over our most formidable competitors at foreign markets.

And when the branches that are already intended are executed, and others that may be useful and practicable, are joined to this canal, the trade of a considerable part of the kingdom will receive the advantage of this new conveyance. It is therefore to be wished, that the main trunk may be terminated so as to facilitate commerce in the best manner, and such as shall most easily admit of further extension. For these purposes, the undertakers of this intended navigation are desirous that it may be terminated in a free part of the Trent at one end, and carried to a part of the river Mersey at the other, which is not liable to be interrupted by neap tides. By which means a communication may also be opened with the great manufacturing town of Manchester, and its neighbourhood ; from whence the canal may be extended over the river into Lancashire, to the general benefit of the interior parts of that county, as well as the port of Liverpool, and of all the towns and places through the whole extent of the navigation.

That it would be a very great limitation of its utility, and consequently a public injury, to mutilate this great canal, by terminating it at Burton and Northwich, we presume will appear to every impartial person, from the following considerations.

By means of the junction of the great trunk with the Duke of Bridgewater's canal near Preston Brook, merchandise will be conveyed from that part of the navigation near Middlewich to Manchester, without the interruption of a single lock, or the expense, damage, or delays occasioned by transshipping, uniformly and certainly in 12 hours ; and from that part

of the canal opposite to Northwich in 10 hours. But if this should terminate in the river Weaver at Northwich, there must be 49 feet of lockage between Middlewich and that place ; which, at seven feet to a lock, will require seven locks, and between Northwich and the river Mersey there must be five locks more ; so that all the goods going this way to Manchester, and its neighbourhood, must be carried down a kind of navigable steps 75 feet to descend into the Mersey ; and then be mounted up another series of steps 79 feet high, to come into the Duke of Bridge-water's canal to go to Manchester.

It is also necessary to observe, that all the goods must be transhipped at Northwich, which must occasion delays as well as damage, and that the vessels must wait for a sufficient tide to carry them into the river Mersey ; and when they get there, they must lie at anchor till another tide enables them to turn a point of land, and get up to Runcorn Gap. This will be the quickest passage they can make : but they may meet with contrary winds, or stormy weather, that may retard their passage many days longer.

It is also very material to observe the different lengths of these two roads from Northwich to Manchester. By the rivers, the distance is 48 miles ; by the Duke's canal, only 32 miles.

Another very material circumstance attending carriage is the price of it. As the time and risk in going from Northwich to Runcorn, by the two rivers, will always be as much, and often more than in going to Liverpool, the price will at least be equal. The comparative expense of carrying goods by the canal at Northwich, and sending them down the river Weaver, into the river Mersey, and up the Duke's

canal to Manchester; and of conveying them from the same place upon a level through the two canals, to that great manufacturing town, will stand as follows:

|                                                                                                                                             |     |    |   |
|---------------------------------------------------------------------------------------------------------------------------------------------|-----|----|---|
| Tonnage and freight from Northwich to Liverpool is 5s. 3d. per ton, and we cannot suppose it less to Runcorn, admit it to be the same ..... | £ 0 | 5  | 3 |
| Wharfage, transshipping, &c. suppose only per ton .....                                                                                     | 0   | 0  | 9 |
| Freight and tonnage on the Duke's canal to Manchester per ton .....                                                                         | 0   | 4  | 0 |
| Total .....                                                                                                                                 | £ 0 | 10 | 0 |

By the other way it will stand thus:

|                                                                                                                  |     |   |   |
|------------------------------------------------------------------------------------------------------------------|-----|---|---|
| From Northwich to the point of junction with the Duke's canal at Preston Brook, being eight miles, per ton ..... | £ 0 | 1 | 0 |
| From thence to Manchester .....                                                                                  | 0   | 2 | 6 |
| Freight, 32 miles, there being no lock .....                                                                     | 0   | 1 | 8 |
| Total .....                                                                                                      | £ 0 | 5 | 2 |

A difference, in favour of the article going to market, of 4s. 10d. in 10s. being very nearly half, and no impediments in the way.

But suppose the expense, upon this comparison, should have turned out just the contrary, and the expense had been equal, certainly the risk and delay of the circuitous conveyance would prevent the Manchester goods from ever being sent this way: and indeed, to all who know the circumstances, the pro-

posal must appear too ridiculous to merit a serious refutation.

If goods are taken off the canal at Northwich to be sent down the Weaver, they will be liable to be retarded in the first place at Pickering's locks; about four miles above Frodsham-bridge, where there is a shallow, by which vessels are detained sometimes five, six, or seven days for want of water. The spring tides flow only here about an hour and a half each tide; and it is only during that space of time (except in land floods) that a boat can pass this shallow. There is likewise above Frodsham-bridge a bar that runs across the river, which, during low neap tides, is impassable for three or four days. There are likewise several other shallows in this river. These delays and inconveniencies render this navigation ineffectual for the conveyance of the produce even of the county of Chester, as far the most considerable part of the cheese produced in that county is now carried by land even parallel with the whole length of this *excellent* navigation (as it is called) to Frodsham-bridge and Bank Quay; from which places it is conveyed by flats to Liverpool, there to be reshipped for London and other markets. Salt likewise, the other staple article of this county, is sent in great quantities by land carriage from Northwich to Manchester, not only for the supply of that town, but its extensive neighbourhood, and notwithstanding the present navigable communication between those places. These facts prove to a demonstration how ineffectual the present navigations are for the commerce of the country they pass through, and how much the counties of Lancashire and Cheshire in particular are interested in having a better conveyance. And by the

immense quantities of earth brought down by the artificial river navigations (which are perpetually robbing the land-owners of parts of their estates) the depth of water in the rivers is constantly diminishing; so that these interruptions will be always growing worse.

Why should the merchandise on this great canal be subject to go by a dear and bad way, when it may go by a cheaper and a better? This would be sacrificing the public interest to a small concern, by which no person can suffer, as the salt from Winsford and Northwich will continue to go down the river Weaver to avoid transshipping; as that article alone will pay the interest of the debt, and as a considerable part upon that navigation may be paid off, if the trustees think proper, before the grand trunk can be finished.

Let it also be well observed, for it is a circumstance of great importance, that the water at Run-corn is above five feet higher than at Pickering's lock, and that such vessels as will be used in this trade will not be liable to be interrupted there by neap tides.

These are facts, which, independent of the great object of going by a canal all the way to Liverpool, are, we presume, sufficient to convince every impartial person, that it would be against the public interest to terminate the canal at Northwich.

It is likewise presumed, that the following important facts will also shew that the other end ought not to terminate at Burton.

The river Trent is navigable by nature from Gainsborough to Wilden; and by an act passed the 10th and 11th of William III. the Lord Paget and his heirs were empowered to make it navigable from



Wilden to Burton ; for which they were to receive a duty of 3*d.* per ton on all vessels navigating that part of the river.

In pursuance of this act, the river has not been .. pounded one inch higher than it was before, and consequently the navigation hath not been much improved. Passages have only been opened through two mill-weirs, by means of two locks, which have frequently been made use of, not to facilitate, but to obstruct the navigation ; and by a clause in this act all persons are restrained from building wharfs or warehouses on the sides of the river, without the consent of the noble undertaker and the commissioners. This circumstance, under the management of the lessees, hath rendered the navigation a complete monopoly.

The distance from Burton to Wilden, by the river, is about 20 miles ; and from Burton to Wilden, by the intended canal, only 16 miles.

If the canal should terminate at Burton, as the mills and forge below the town are in possession of the present lessees of that navigation, it would be in their power, by drawing off the water, to lay the boats aground between the warehouses and the mills ; and thereby to distress the vessels, and to interrupt all the commerce that might depend on that part of the river.

There are upwards of 20 shallows between Burton and Wilden, which are not navigable, except when there are freshes in the river ; but by means of flushes of water let off from the mills, and by withholding this water, the lessees may interrupt, and frequently have interrupted, the navigation below Burton lock ; so that the navigation of this part of the Trent depends entirely upon their pleasure.

In the weir at King's Mills there are a number of flood-gates ; one of which is very large, and was made by a former lessee on purpose to draw the water off suddenly ; and by means of these flood-gates the water may also be withheld or let off by the occupier of those mills, so as totally to interrupt the navigation.

In the year 1749, the lessees took an opportunity, when all the boats belonging to a certain company, which they wanted to distress, were below this weir, to sink a boat laden with stones in the lock ; and this answered their purpose, although a great injury to the public ; for all the goods that went down the navigation during the space of 8 years and 8 months, were, by the continuance of this obstacle, under a necessity of being taken out of the boats above the lock, and were then carried, or rather rolled and tumbled, into the other vessels below ; by which means many goods received great injury ; and much earthenware especially was sent to foreign markets broken and destroyed, under all the expenses of whole, sound, and perfect merchandise.

If the canal terminates at Wilden, the manufactures, malt, and other produce of those parts of Leicestershire, Derbyshire, and Nottinghamshire, that lie near to the termination, may be conveyed by water from Wilden to Liverpool, and several northern counties, and entirely escape the shallows and other inconveniencies of the Burton navigation. But if the navigation were to terminate at Burton, all the goods going upwards from the above-mentioned district must either be liable to the inconveniencies of that navigation, or be subject to the expense of land carriage of 10 or 15 miles ; which expense would convey them half way to Liverpool.

In answer to the objection, that there are several shallows in the Burton navigation, it has been replied that there are several shallows below Wilden; by which reply it is insinuated, that if we have 20 difficulties to overcome, and cannot obviate them all, there is no advantage in avoiding one half of them:—an insinuation that might have some little weight, if boats could not frequently pass over the shallows below Wilden, by means of the additional water and freshes of the rivers Derwent and Soar, when the shallows above Wilden are impassable.

The low tonnage on the Burton navigation is also produced as an argument against extending the canal to Wilden; but although the lessees are not empowered to take more than 3*d.* under the name of tonnage, yet they find means to take eight times that sum on the goods carried by others, under the name of wharfage. And if it should likewise appear, besides the expedition and uniform dispatch of a canal navigation, that goods may be conveyed to Gainsborough, from that part of the canal opposite to Burton, much cheaper than they are now carried by the river, it may certainly be presumed the advantage of extending the canal to Wilden will not admit of the least hesitation; and surely this is a plan of too much consequence to be limited, for the sake of those to whom the public are not so much indebted for their past services, as to lie under an obligation to indulge them in their attempts to prevent any one else from serving it better.

On the best authority it is asserted, that the present average price of carriage, by the river from Burton to Gainsborough, is 12*s.* per ton.....£0 12 0

Brought forward ..... £ 0 12 0

From Wilden to Gainsborough, a distance of about 90 miles, goods will be conveyed at 5s. per ton. .... 0 5 0

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£ 0 7 0

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Therefore from Burton to Wilden, about 19 miles, the expense is 7s. per ton. ....

0 7 0

By the canal from Burton to Wilden, being about 15 miles, the tonnage and wharfage for that distance, at  $1\frac{1}{2}d.$

per ton per mile, amount to £0 1 10 $\frac{1}{2}$

Freight, at the rate of  $6d.$

per ton for 10 miles, is .... 0 0 9

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0 2 7 $\frac{1}{2}$  0 2 7 $\frac{1}{2}$

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Here is proved the saving to the public, by extending the canal to Wilden, of

4s.  $4\frac{1}{2}d.$  per ton ..... 0 4 4 $\frac{1}{2}$

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It is therefore humbly submitted to the legislature, all these circumstances being considered, whether it would not be a very great injury to the public to fix the end of a canal, of such length and immense importance as that from the Trent to the Mersey, in so bad a part of a river which is a monopoly, when it may be so advantageously terminated in a better part of that river which is free ?

Seven public meetings, and three surveys were taken before they would ultimately fix on this great national business, which from the first to the last took up 10 years before the general approved fiat was given to its exact terminations, on the 30th of December 1765; but on the 27th of June preceding, at a public meeting the plan was agreed on, the heads of a bill produced, read over and approved, and near 20,000*l.* were subscribed that day.

But at this time also another curious pamphlet\* was published upon this subject, of which above 1000 copies were sold and distributed; and in this pamphlet the intended junction with the Duke of Bridgewater's navigation was expressly mentioned.

Upon an impartial and comprehensive view of the case, respecting the intended canal from the Trent to the Mersey, the friends of that undertaking hope it will appear, that the great outlines of this design were sketched out above 10 years ago; that the plan has received many improvements; and the preference given to the terminations fixed by the bill, as it now stands, is supported by the clearest reasons of public utility; that the execution of this plan will be a great, permanent, and public benefit to the agriculture and commerce of this kingdom; that it will reduce the price of carriage 6*s.* in 8*s.* and thereby enable us to meet our commercial competitors at foreign markets, upon much better terms than

\* A View of the Advantages of Inland Navigation; printed for Becket and De Hondt in the Strand, and Johnson and Davenport, Paternoster-row; to which I beg leave to refer for ample proofs of the utility of the intended canal from the Trent to the Mersey.

we can at present; that it will greatly preserve the public roads, and lessen the expense of keeping them in repair; that it will advance the wealth and strength of the nation, by increasing the quantity of our home products and of our exports, and by finding employment for a greater number of vessels and seamen; that it will diffuse a spirit of navigation through the very heart of the kingdom, and, by bringing many boys and youths from the inland towns towards the sea-port towns, greatly increase the number of our sailors; that it will find immediate and constant employment for vast numbers of people: and, lastly, that it will have a tendency to prevent monopolies of the necessaries of life, by opening so extensive and cheap a communication between the interior parts of the kingdom and our manufacturing towns, villages, and sea-ports; for the attempts of the most powerful monopolizer must certainly be ineffectual in a country where plenty can be thrown into any market, from all parts, in a very short time, by navigable canals.

I mentioned giving answers to both plans of canals, but that being chiefly done as I went along with the last, a long *pro* and *con* story is useless, and not agreeable to the brevity with which I mean to treat the subject. I design to extract every thing useful and interesting in the shortest manner possible. Those whose curiosity and leisure create a desire of further particulars I refer to my quarto volume, and the pamphlets I have mentioned; I shall omit any farther account of the Trent and Mersey canal, to give the particulars of other navigations cut out of this great trunk.

But before I proceed, I must beg leave to observe

that during the contest of parties, a bill was brought into parliament by the Cheshire gentlemen in order to establish the Macclesfield canal. It passed the House of Commons, but was dismissed by the Lords. Another bill, for leave to cut a navigation from Wilden Ferry to the Duke of Bridgewater's canal at Preston Brook, and from thence jointly to be carried on to the river Mersey, at or near Runcorn Gap, passed both houses of parliament. As did a third bill for cutting a navigable canal from the river Severn between Bewdley and Titton Brook in Worcestershire, to cross the river Trent at or near Haywood Mill, in Staffordshire, called the Wolverhampton canal, and which I have mentioned in treating of the last canal, and intended to communicate with the canal to be made from the Trent to the river Mersey, as before described.

#### COVENTRY CANAL TO OXFORD.

A meeting was held at Banbury on the 3d of October 1768, and again on the 25th of the same month, to take into consideration proposals for making a canal from the city of Coventry into the river Thames at the city of Oxford; which meeting was attended by a great number of noblemen, gentlemen, land-owners, merchants, and capital manufacturers, not only of the county of Oxford, but also of all the neighbouring counties; among whom were the Dukes of Marlborough and Buccleugh, the Lords Spencer, Guildford, and North, the Vice Chancellor, and many of the heads of houses, the two members for the University, with many other gentlemen of great weight and consequence, as well as the corpo-

rations of Oxford, Woodstock, Banbury, and Coventry; and upon the great and important question of a navigable canal projected by Mr. Brindley to be cut from Coventry to Oxford, the company present were perfectly unanimous with respect to the utility of the design, and shewed an uncommon alacrity in raising the money to carry it into execution; at the same time expressing their most sanguine wishes for the success of the undertaking.

It was proposed to make this navigable canal to communicate with the canal now making from the city of Coventry to the great Staffordshire navigation, which joins the grand trunk at Litchfield. The canal is intended to pass through the several parishes, hamlets, or places of Stoke, Binley, Comb, Brinklow, Long Lawford, Newbold, Brownsover, Clifton, Hillmorton, Barby, Willoughby, Braunston, Wolfhamcote, Lower Shuckburgh, Napton, Priors Marston, Priors Hardwick, Wormleighton, Fenny Compton, Burton, Dasset, Warmington, Shotwell, Mollington, Horley, Neithrop, and Banbury; and from thence through Adderbury, Deddington, North Aston, Middle Aston, Steeple Aston, Rousham, Shipton, Hampton Gay, Yarnton, and Woolvercot, to the city of Oxford, to communicate with the navigation of the Thames; which places had been surveyed by Mr. Brindley, and the undertaking found to be practicable.

The sense of the county being known by the above meeting, Mr. Brindley's report and proposals were taken into consideration, and it was resolved to apply immediately to parliament for permission to carry this great design into execution; a design of the most



general and extensive utility to the public at large, and highly conducive to the particular benefit of the counties of Warwick, Northampton, and Oxford. It was also resolved, that should the application to parliament be crowned with success (of which no doubt could be entertained), the undertaking should be vested in a company subscribing according to certain rules, as laid down in the act, and receiving profits agreeable to other navigation acts lately obtained.

Upwards of 50,000 *l.* were instantly subscribed by the company then present, for the immediate support and promotion of the plan; and Mr. Dadley, of Coventry, and Mr. Walker, town-clerk of Oxford, were ordered to prepare and solicit the bill, and subscriptions for the residue of the sum wanted were soon completed.

By the Coventry act 50,000 *l.* is the original sum to be raised. This sum is divided into 500 shares of 100 *l.* each. The shares are made personal estate, and transferable as such. The money subscribed in shares is made payable by different calls or instalments; and no call is to exceed ten per cent. at any one time, and between every call to that amount must be an interval of three months. The facility of payment under this provision need not be enlarged upon. An interest of 5 *l.* per cent. regularly paid at a stated day in every year, attends the sum advanced upon every call; and when the whole navigation is completed, every proprietor becomes entitled to a share of the full profit, answerable to the number of shares of which he may be possessed.

The promising state of the Cheshire and Staffordshire navigations encouraged the gentlemen of War-

wickshire to set on foot another branch of inland navigation, and which extends from the grand trunk at Fradley Heath, in the county of Stafford, to the city of Coventry, to join that canal which is cutting into the river Thames at Oxford ; and it is proposed to carry on the same from Coventry by the town of Warwick to Stratford-upon-Avon.

An act having been obtained for the completion of that part of this canal which goes to the city of Coventry, and which there joins the canal to Oxford ; which canal is finished, and has enabled the proprietors specified in the act to cut through the different parishes, hamlets, and places of Fradley near Litchfield, Streethay, Huddlesford, Whittington, Hoppas, Bonehill, Fazeley, Tamworth, Ammington, Polesworth, Grindon, Dordon, Merivale, Atherstone, Mancetter, Hartshill, Nuneaton, Coton, Bedsworth, Exhall, Longford, Foleshill, to the city of Coventry, with branches out of the said canal to the several coal-works in its route.

This canal from Fradley Heath to Coventry was begun in 1768, and but small progress was made in it for some time, when it was found absolutely necessary, on account of other cuts requisite to be made to different towns and villages, and also to some collieries in the neighbourhood of this canal, to apply again to parliament, which was done in 1784, to explain and amend the former acts ; and also to incorporate in one the different companies, and connect the different canals.

The act obtained in consequence of this application is entitled, An Act to enable the Company of Proprietors of the Navigation from the Trent to the Mersey, and the Company of Proprietors of the

Navigation from Birmingham to Fazeley, to make a navigable Canal from the said Trent and Mersey Navigation (the Grand Trunk) on Fradley Heath in the County of Stafford, to Fazeley in the said County; and for confirming certain Articles of Agreement entered into by the said Trent and Mersey, the Oxford, and the Coventry Navigation Companies.— Here follows a very long act, which is useless to be repeated here. It may always be bought by the curious.

The course of these canals has been given before. I have now to give the lengths, falls, and rises. From the grand trunk at Fradley Heath to the junction at Fazeley is 11 miles, on a level. From Fazeley to Atherstone is 10 miles, with 87 feet rise. From thence to Coventry is 17 miles on a level; making a total distance to Coventry 38 miles. From Coventry to Hill Morton is 27 miles, and level. From thence to Marton-doles is 18 miles, with a rise of 76 feet 4 inches. From thence to the extent of the summit near Claydon is 11 miles, and level; and from thence to Oxford is 36 miles, with a fall of 180 feet 6 inches. Total distance from Coventry to Oxford is 92 miles.

Nov. 1802.—*Remarks on the progress of Canals.*

Coventry canal shares have fallen from 400 *l.* to 350 *l.* the competition between that and the Warwick has lessened the profits of both. The former, an old established concern, will not submit to be underworked by the latter. They will soon come to a better understanding. In the mean time the public are benefited by the low rates levied by each. Coventry last dividend was 8 *l.*

#### BIRMINGHAM AND FAZELEY CANAL.

In 1785 an act of parliament was obtained to enable the company of proprietors of the navigation from

the Trent to the Mersey, and the company of proprietors of the navigation from Birmingham to Fazeley, to make a navigable canal from the said Trent and Mersey navigation on Fradley Heath, in the county of Stafford; to Fazeley, in the said county, and for confirming certain articles of agreement entered into between the said Trent and Mersey, the Oxford, and the Coventry canal companies. The act contains first a recital of the act of 6 Geo. III. for making a canal from the Trent to the Mersey; and also of the act of the 16 Geo. III. for making a branch to Froghall and Caldon for the conveyance of coals, stone and other goods, and to and near several lime-works and lime-stone quarries which are at or near Caldon in the county of Stafford, which branch has been made and completed. It also recites another act passed 23 Geo. III. for consolidating the said canals, and an act of 8 Geo. III. for making a canal from Coventry to join the first-mentioned canal on Fradley Heath. It also recites another act of 9 Geo. III. for making a canal from Coventry to Oxford, and an agreement of the delegates from the said companies at Coleshill in the county of Warwick, on the 20th June 1782. Then follows a part of act of 23 Geo. III. for making the canal from Birmingham to Fazeley, and for ratifying the articles of agreement of delegates, dated 29 Oct. 1783, whereby the said portion of canal is divided between the said two companies.

After numerous other articles unnecessary to mention, this undertaking is declared consolidated with the others of the Trent and Mersey navigations, and the proprietors are empowered to borrow 10.000 £. and assign the tolls as security; and after reciting the

articles of agreement between the grand trunk and Coventry canal companies of the 29th of Oct. 1783, and confirming the said agreement, and providing for equalizing the tonnage of coals upon the Oxford and Coventry canal, the act is declared to be a public act.

On the 12th of July 1790, the aqueduct across the river Tame near Birmingham, in the county of Stafford, was finished ; and the Coventry canal, with the grand trunk, and Birmingham and Fazeley navigations, completed ; and thereby the long desired communications by inland navigation between the ports of London, Bristol, Liverpool, and Hull, are completely opened.

The length of this canal, from Birmingham to Fazeley, is  $16\frac{1}{4}$  miles ; and it has a fall of 248 feet. This includes the collateral cut to Digbeth, in Birmingham. The length of the canal from the grand trunk at Stoke, near Newcastle, to Froghall and Caldon coal-pits and lime-stone quarries, is 19 miles 3 furlongs 18 chains, with a rise of 75 feet in the first  $6\frac{1}{4}$  miles to Stanley Moss ; and a fall of 60 feet 10 inches, the remainder of the way to the coal-pits and lime-quarries. Another canal has also been cut from Rider's Green, near Birmingham, to Broad-water fire-engine coal-mines, being  $4\frac{1}{2}$  miles and 6 chains, with a fall of 46 feet.

#### DROITWICH CANAL.

The course of this canal begins in the town of Droitwich, and county of Worcester, and near Apple-tree Hill, whence it proceeds to Bryer's Mill, and over Falsham-Pill Brook to Salwarp, over Martin Brook by Hill End, through Ladywood, over Atter-

burn Brook, by Jacob's Ladder and Hawfordrough to Hill Top, and cross the road from Kidderminster to Worcester, by Hawford House, into the Severn, near the place where the little river Salwarp joins the Severn, being a navigable course of five miles and five furlongs, and a fall of 56 feet 6 inches. The particulars of the trade, manufactures, and produce I have before given at large; when treating of the course of the intended navigations, which have been since executed, for joining the rivers Severn, Trent, and Mersey, to communicate with Bristol, Liverpool, and Hull.

A short description of the river Severn, I hope will be acceptable; few people, even in the eastern, southern, or northern parts of England, have an idea of the length of its navigation, or the great trade carried thereon, which has been an inducement for canals to be cut at every part possible to have the advantage of carrying their manufactures and produce of the interior counties by water to Bristol, where they are sure of a market.

The river Severn has its source from a large bog on the top of Plinlimmon, a mountain in Montgomeryshire in North Wales; from whence, rushing down with a swift current, and being joined by many lesser torrents, it presently appears considerable; and passing by Llanydlos and Newtown becomes navigable near Welchpool, where the river Vernew joins it, with a stream very little inferior to its own; from thence it proceeds on gently to Shrewsbury, which it surrounds nearly in the form of a horse-shoe, it then flows on through a rich vale, with many extensive windings, till it comes to Benthall Edge, by the way receiving into it the river Tern, which waters all

the north of Shropshire. Here the Severn begins to be rapid, being pent up between two opposite hills, both very lofty and steep; and from thence to Bridgenorth and Bewdley the channel is confined by high woody banks and rocky cliffs, which afford variety of beautiful prospects. Afterwards it gently glides on through the fruitful plains of Worcestershire, visiting in its way the city itself, and a little below is considerably augmented by the influx of the river Teme. This addition, however, is much inferior to that which it receives from its junction with the river Avon at Tewksbury, which is navigable up to Pershore, Evesham, and Stratford. These two rivers thus united pursue their course to Gloucester, and about 50 miles below that city the name of Severn is lost in the Bristol Channel.

This river, justly esteemed the second in Britain, is of great importance, being navigable by vessels of large burthen more than 160 miles from the sea, without the assistance of any lock. Upwards of 100,000 tons of coals are annually shipped from the collieries about Madeley and Broseley, for the cities and towns situate on its banks, and thence conveyed into the adjacent countries. Great quantities of grain, pig and bar iron, iron manufactures, and earthenware, as well as wool, hops, cyder, and provisions, are likewise continually sent to Bristol, and other places, from whence various kinds of goods are brought in return. The freight from Shrewsbury to Bristol is about 10s. per ton, and from Bristol to Shrewsbury 15s. per ton. The rates to the intermediate towns are in proportion,

The following are the distances and rise for the first 70 miles, viz. From Gloucester to Worcester 30

miles, rise 10 feet. From thence to Stornport 13 miles, rise 23 feet. From thence to Bridgenorth 18 miles, rise 41 feet 9 inches. From thence to Meadow Wharf at Coalbrook Dale 9 miles, rise 29 feet 6 inches. Total rise 104 feet 3 inches.

This traffic is carried on with two sorts of vessels: the lesser sort are called barges and frigates, being from 40 to 60 feet in length, having a single mast and square-sail, and carrying from 20 to 40 tons burthen. The trows, or larger vessels, are from 40 to 80 tons burthen. These have a main and top mast about 80 feet high, with square sails, and some of them have mizen masts: they are generally from 16 to 20 feet wide, and 16 in length, being when new and completely rigged worth about 300 *l*.

In May 1756 the number of barges and trows on the river Severn, navigating from Welchpool and Poolstake downwards to Bristol, amounted to 376; and since that time, by the addition of the inland navigation from the Trent, Mersey, and the Thames, into the Stroud navigation, they may now be fairly calculated at double that number. These are navigated by three or four, and some by six or eight men, who are generally hardy, robust, and resolute; so that this navigation proves a valuable nursery for seamen.

#### JUNCTION OF THE THAMES AND THE SEVERN.

*Preamble extracted from the act of parliament passed in 1783.*

Whereas the making and maintaining the canal, with a proper collateral cut for the navigation of boats, barges, and other vessels from the river Thames or Isis, at some place at or near Lechlade in



the county of Gloucester, to join and communicate with a navigable cut or canal now made between the town of Stroud and the river Severn, in the said county of Gloucester, will open an easy communication between the interior parts of the kingdom and the port of London, which will be of great advantage to many of the sea-ports of this kingdom, and will afford a supply of coals to those parts of the country through which the intended canal and collateral cut are proposed to be made ; and will also be of great public utility : And whereas the several persons hereinafter particularly named are desirous, at their own proper costs and charges, to begin, carry on, complete, and maintain the said navigable canal and collateral cut, intended to be made by virtue of this act ; but the same cannot be effected without the aid and authority of parliament : wherefore, for the obtaining and perfecting the good ends and purposes aforesaid, &c. &c. &c.

N. B. It being a most extraordinary long act, and as a short abstract would mutilate it so as to render it almost unintelligible, I therefore omit it altogether, especially as those who particularly want to see it can at any time purchase it.

History informs us, that so long ago as the reign of Charles II. a project was set on foot for uniting the Thames with the Severn, by cutting a channel of above 40 miles in length ; and that a bill was brought for that purpose into the House of Commons. Joseph Moxon, who was hydrographer to the king, and an excellent mathematician, drew a map for Mr. Matthews, to shew that the scheme was practicable.

In Dr. Campbell's Political Survey of Great Britain he observes, that " the correspondence between Lon-

don and Bristol being very expensive by land, and tedious by sea, it was natural to endeavour at finding some means of lessening at least, if not removing, these inconveniencies. In order to this it was proposed to make use of the river Avon, which runs to Bristol, and the Kennet, which falls into the Thames; but it does not appear that this went any further than speculation. In the reign of Charles II. a bill was brought into the House of Commons, to unite, by a new cut from Lechlade, the Thames with the Avon, that passes through Bath. Captain Yarranton proposed the same thing, by uniting the Thames by the Charwell, to the Avon by the Stour, and so to the Severn, with only eight miles of land-carriage. It seemed quite necessary to mention these, because it may become requisite to review and fix on some one of them at a future time, when, in consequence of a method to be hereafter explained, a communication shall be accomplished between Hull, Liverpool, and Bristol; for in that case some such communication by water will be necessary to maintain that intercourse between the midland counties and the capital, which is of so great consequence to both."—So far Dr. Campbell. It is needless to observe, that what he suggested is now completed, although not by the course he has pointed out.

The execution of this grand work, with others equally wonderful and useful in different parts of this kingdom, was reserved for the reign of George III. I shall hereafter mention the canal cut from Stroud to the Severn, near Framiload, after many unsuccessful attempts to make the river Stroudwater navigable. Mr. Robert Whitworth, that able and successful engineer in works of this kind, was employed

in 1782, at the desire of several opulent private persons, chiefly merchants of London (not the corporation), who had no local interest in either of the counties of Wilts or Gloucester, through which the canal passes. The act passed in 1783; and was agreeable to the plan and estimate of their engineer, who had stated the sum requisite to complete the undertaking at 130,000*l.* and was empowered to borrow a further sum of 60,000*l.* more on mortgage, if wanted, to finish the canal, under their common seal.

So favourable an idea was entertained by the citizens of London of the utility of this junction of the Thames with the Severn, that if its completion had called for a million instead of 130,000*l.* the fund would have been presently subscribed. The connections of one mercantile house alone subscribed 23,000*l.* and several others 10,000*l.* each.

This navigable canal begins at Wallbridge, near Stroud (at the very place where the Stroud navigation ends), and proceeds to very near Lechlade, on the river Thames, being a distance of 30 miles  $7\frac{1}{2}$  chains, exact measurement. The general breadth of the canal is 42 feet at top, and 30 feet at the bottom. In many places, where the ground is a dead level, it is considerably wider; the banks and towing-paths being made entirely with the soil dug from the canal. The tunnel at Sapperton is nearly  $2\frac{1}{2}$  miles in length, being lined with masonry, and arched over at top, with an inverted arch at the bottom, except at some few places, where the solid rock being scooped out renders it unnecessary. The expense of which was about 8 guineas per cubic yard. The boats are 12 feet wide, and 80 feet long, and

when loaded draw four feet water, and will carry 70 tons.

In order to form any judgment of the importance to commerce of this undertaking, it will be necessary to take a large and comprehensive view of the intercourse between the ports of Wales, Bristol, Gloucester, Worcester, and even Shrewsbury; and also of the numerous inland navigations connected with the Staffordshire and Worcestershire canal; and of the intermediate courses of the river Thames, from Lechlade, by Oxford, Wallingford, and Reading to London. The various articles of produce and manufactures in such a scope of country, which comprehends the whole internal-trade of the kingdom, are more perhaps than I can immediately enumerate; and indeed such an enumeration is almost needless after what I have already given, when speaking of the course of the canals.

The advantages to the inhabitants living on the banks of the canals, and also on the banks of the rivers into which canals are cut, are almost inconceivable. The artist, the trader, the manufacturer, are all enticed as it were to industry, as new veins of trade are opened to their view, and by the constant, easy, cheap, and certain carriage of their goods to a market, while raw materials for working are brought back to their doors by the same conveyance. The connection of the river Thames with the Severn, by the means of this canal, and also with the internal parts of the kingdom, by the Oxford and Coventry canals, which lead to Birmingham, and also the counties of Stafford, York, Chester, and even to Westmorland, forms a line of communication with the capital, of the greatest importance, and which cannot but ex-

cite a prodigious spirit of enterprise among the citizens and traders.

On the 20th of April 1789, Mr. Clowes, the acting engineer, left to conduct the business under Mr. Whitworth (who was then also employed in the Firth and Clyde navigation in Scotland), passed through the tunnel for the first time at Sapperton, in a vessel of 30 tons burthen; and the junction was completed, and a vessel passed from the Severn into the Thames for the first time on the 19th of November in the same year, in the presence of a multitude of people who came from all parts of the country, for 10 or 12 miles, on the occasion.

On the 19th of July 1788, when their Majesties were at Cheltenham, they expressed a desire to view the tunnel at Sapperton, in the praise of which fame had been so lavish. Accordingly that day was appointed, and his Majesty viewed the entrance with astonishment and delight, and bestowed the highest praise on a work of such magnitude, expense, and general utility, and expressed still greater satisfaction on being informed that it had been conducted and completed by private gentlemen.

The length of the canal, I have before observed, is thirty miles seven chains and a half, of which from Stroud to Sapperton is seven miles three furlongs, with a rise of 241 feet 3 inches; from Sapperton tunnel to Upper Siddington, and the branch to Cirencester, 9 miles and  $8\frac{1}{2}$  chains, and is level; from Upper Siddington to Lechlade is 13 miles 4 furlongs and 9 chains, and with a fall of 130 feet 6 inches.

## STROUD CANAL INTO THE SEVERN.

The plan for making the river of Stroudwater navigable was first formed, and an act obtained for carrying it into execution, in the year 1730; but though this undertaking was promoted with great spirit, whether from the want of money, or some misunderstanding among those engaged in it, or on account of the supposed loss of water to the millers, it was never completed.

In the year 1755 a new survey and an estimate of the expense of making the said river navigable were ordered; but another scheme was soon afterwards proposed by four private gentlemen to undertake the work at their own expense, without locks (and consequently without any loss of water to the millers), by shifting the cargoes into boxes, and at every mill into other boats by means of cranes. This proposal was preferred and accepted; and in the year 1759 an act was obtained for executing it. But this scheme likewise, which did not promise much benefit to the country, in the end totally miscarried, and the projectors were nearly ruined.

In the year 1774, when many navigations had been successfully planned and completed in different parts of the kingdom, the project was again revived of effecting the navigation of the Stroudwater to the Severn by a new canal. New surveys were in consequence taken, plans drawn, and estimates made by Thomas Yeoman, engineer, F. R. S. and other surveyors, after the manner of the most improved navigations, whereby the old river is as much as possible avoided, and the interference with the mills, which has always been an obstacle, very much prevented,

as the canal communicates with the river only in three places.

When an act had been obtained which granted sufficient powers to complete the work, a subscription was opened for 20,000*l.* divided into 200 shares, which was very soon filled. Articles were executed stating the rights and powers of the proprietors; calls were made upon the subscribers agreeably to the articles; lands were purchased, and materials provided. Thus the navigation went on smoothly and expeditiously; but certain land-holders, through whose lands the line of this navigation must pass, obstinately opposed it. They were joined by a few mill-holders upon the river. These persons advertised meetings, at which they opened a subscription, and raised a fund professedly to be spent in opposition to the navigation; in consequence of which an action was laid by a mill-holder at Framiload, for cutting through a small piece of ground, which it was his interest to prevent. The court of Exchequer was moved to stop proceedings on the canal, and the question was brought to issue at Gloucester assizes, when it was determined, that a canal navigation as this was deemed (though falsely, as it communicates with the river in three places) could not be made under the powers of the act of 1730, notwithstanding the words of the act were, "That the undertakers are empowered to make as many new cuts as they may judge proper, and of what length and breadth they shall think convenient."

In consequence of this determination another act was applied for, and obtained in 1775, under which the work is now finished, and will prove of very great advantage to the country.

The only double lock on this canal rises 14 feet, and on one side of it is a bank 20 feet high from the bed of the river; this bank was continually sliding down when cut through. The committee made several fruitless applications to different persons to undertake the erecting of this lock; at length Anthony Keck, Esq. architect, of King's Stanley, who was a person of great abilities, agreed to complete it for a certain sum of money, the committee to deliver the bricks on the spot at per 1000. Models and sections were made by the contractor; with sills and uprights framed, with braces and ties, and plates to keep the bank from forcing against the walls of the locks, all of which when completed were approved of by the committee. After being finished nearly 12 months the walls began to bulge in, till no barge could go through without danger; the wall being taken down, an action was commenced against the said Anthony Keck, and at the trial at Gloucester assizes the model was produced, and one of the principal pieces of timber not being the exact size exhibited in the model, the learned counsel (Bearington) for the committee, often observed to the jury—"Gentlemen, can a packthread string be as strong as a cable rope?" The contractor was cast, with costs of suit, and was obliged to rebuild the lock, which was immediately begun on a different plan, viz. by turning about two brick cylinders of 4 feet diameter, against the bank, which had the desired effect, and stands to this day.

Out of 30 law-suits relative to this canal, no one excited such general interest.

The noted Mr. Edge was mason, and Mr. Booth the bricklayer.



The course of this canal begins at Bad Brook, at the edge of the town of Stroud, passes on to Cain's Cross by Ebley, and across the main road at Stone Cross, and by Stone House, near Rycott Mill, and to Lockham bridge; then crosses the river near Whitminster Mill, and goes into the Severn at Framiload, being in length something more than eight miles, and falls 802 feet.

It may not be improper to give a brief description of the cranes and engines made use of in the year 1759, by the four gentlemen who undertook to carry on the navigation without locks.

These cranes were invented by Mr. Bridge of Tewksbury, in the county of Gloucester. He considered the mill-ponds, where there are any, as so many navigations already prepared. If they were good, he did not make them worse; but if they were bad, he made them better, by widening and lengthening them, in order that they might hold more water.

A boat or barge being supposed to swim in this pond or reservoir above the mill, the question is, how shall the lading of such a boat be got into the stream below the mill, or *vice versa*, without the intervention of a lock or locks?—The method taken by him is as follows:

He cut a small canal from the water below the mill, to approach towards the mill or pond above the mill; but kept the upper pond or canal, and the lower canal entirely asunder, by means of a strong bank or wall of earth and clay, about 12 feet thick.

On this bank he erected a crane, or rather a double crane, for it has two necks or levers; and he caused them to act singly or jointly at pleasure.

These necks or levers are made to turn to either the upper or lower canal, as they may be wanted; and when they both turn the same way, they generally act as a balance or scales.

He next proceeded to construct a boat on the lower canal, of the same dimensions exactly with that in the upper; and in both these boats he placed six, seven, eight, or more frames, capable of holding about one ton weight of goods each, and of being lifted up by means of strong hooks, with all the goods upon them.

Matters being thus settled, two men (the boatmen) begin to work the cranes: and then the lever of one crane takes a frame, with all the goods on it, out of one boat, while the other lever is doing the same by the other frame out of the other boat; and after the necks of the cranes are turned about, they interchangeably deposit their contents; both boats being by this means loaded and unloaded at the same time.

Here we may observe there is no expense of locks, no damages arising from floods, or freshes, or frosts, or the concussion of the water; nor is there any the least waste of water; so that the smallest land drain, if enough to supply a canal in a gentleman's garden, is hereby rendered fully adequate to all the purposes of an inland navigation; and when any part of the machine happens to be out of order, it is as easily repaired in winter as in summer. Not to mention, that as the crane is a double one, one part may serve (only using double the time), although the other should be broken. Besides, since all the cranes on the river are of a similar construction, materials for repairing them, such as beams, wheels, pulleys,

chains, ropes, &c. may always be kept in readiness ; so that the whole might be repaired in a few hours. Moreover, as to the difficulties attending heights, falls, or precipices, it is no great difference in the present case, whether the goods are to be lowered down or raised up four feet only, or 24. And as to the important article of dispatch, it can be asserted as a certain fact, which is every day confirmed by experience, that both boats will interchange their respective loadings in less than half an hour.

But to set this scheme in its true light, I have extracted from a long laboured performance in its favour, and the answer to it, the following short unanswerable evidence to prove its insufficiency.

H. M. S.

|                                                                                                         |         |
|---------------------------------------------------------------------------------------------------------|---------|
| The time in making a complete trip<br>and retrip with a 40 ton barge, supposed<br>to be in towing ..... | 8 22 50 |
|---------------------------------------------------------------------------------------------------------|---------|

|                                                                                                                                                |        |
|------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| The time to pass and repass 20 locks,<br>at two minutes each lock, proved to be<br>sufficient by observation as well as calcu-<br>lation ..... | 1 20 0 |
|------------------------------------------------------------------------------------------------------------------------------------------------|--------|

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9 42 50

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|                                                                                                                                                     |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| The time to make a trip and retrip by<br>the 10 ton crane boat, all circumstances<br>being alike, will be found, towing the<br>same as before ..... | 8 22 50 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------|

|                                                                                                                            |        |
|----------------------------------------------------------------------------------------------------------------------------|--------|
| The time to pass and repass at the 20<br>mills or falls, allowing half an hour at<br>each crane up and down, will be ..... | 20 0 0 |
|----------------------------------------------------------------------------------------------------------------------------|--------|

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28 22 50

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Difference of time is 19 hours almost out of 28 hours.

To compare the expense, suppose the towing labour comes to 1s. 6d. a day per man for 12 hours work, the expense of two men for 9 hours 40 minutes 50 seconds, in making a trip and retrip in the 40 ton barge, only..... £0 2 4

The ten ton boat, to make the same trip and retrip, will require, on account of the working the cranes, two men's labour for 28 hours 22 minutes 50 seconds, which comes to 7s. 1d. per trip and retrip, and according to the same rate 40 tons for the labour of freight only come to .... 1 8 4

The difference, being an extra charge by the crane or new scheme navigation for 40 tons freight in every complete voyage up and down 1l. 6s. in 1l. 8s. 4d.

From this calculation it plainly appears, that the new scheme has a disadvantage of nearly 1115l. per cent. and the same disadvantage will proportionably arise on any other extent of navigation. Hence it is evident, that the judgment of the legislature was very right in vesting as it did all the advantage of an invention, which might not seem to them to carry that same prospect of utility, as it did to the machine proprietors of the Stroud navigation.

Nov. 1802. *Remarks on the Progress of Canals.*

The Stroudwater canal requires good management; the last dividend was about 6l. per share; the price about 25l.

INTENDED CANAL FROM MONKEY ISLAND TO  
READING.

In 1754 a proposal was made for opening a navigation between London and Bristol, by the way of Hungerford, Marlborough, Calne, Chippenham, and another by the way of Oxford, Lechdale, Cricklade, Malmesbury, and Chippenham. It was projected to join the Severn, Trent, and Humber, by the means of the two rivulets Penk and Stour, which would give the advantage of water-carriage to seventy-one cities and market towns.

A canal 50 feet wide at top, 30 at bottom, and four feet deep, might be made at the rate of 300 *l.* per mile, by employing the soldiery in the work, with an additional 8*d.* a day, and allowing 700 *l.* a mile for the purchase of grounds, building locks and bridges, and making reservoirs. The amount of the whole expense would be about 1000 *l.* a mile; and consequently 300,000 *l.* would complete a navigable canal 300 miles in length, which is vastly more than necessary for the purposes required.

The proposer of the above scheme confesses himself no engineer (which is very obvious he is not); but says he was led into this train of reflection by a journey he made in the year before (in 1753) through Flanders, where he saw 7000 Austrian soldiers at work on the canals between Ghent and Ostend, to make a watery highway (as he terms it). The expense of this, and the erection of locks at Sas-van-Ghent, could not amount to less than 200,000 *l.* which was to be raised by a land-tax laid on by the assembly of the estates of Brabant, at Brussels. This vast expense was voluntarily incurred only to make a

commercial highway for about 40 miles in length. Of such importance to commerce do that prudent and wise people consider an easy communication between city and city to be. So far my author.

The advantages arising from canal navigations to manufactures, commerce, and agriculture, above those of navigable rivers, are universally acknowledged. There have been many courses for navigable canals pointed out in this kingdom, that are both practicable and eligible; some of which have been carried into execution with honour and profit to the proprietors, and credit to the engineers and conductors, as has already been shewn; but there are none from which greater benefits and advantages would arise to the public, and to the counties through which they pass, than a cut from Monkey Island, in the river Thames, near Maidenhead to Sunning near Reading, in the county of Berks (though this is in fact only part of a larger design, which I shall hereafter mention); for by means of such a canal the price of provisions would be greatly lessened in London, and the country would be supplied with coals at a much cheaper rate. In order to shew the particular advantage of this intended navigation to Reading, the distance is only  $15\frac{1}{4}$  miles, and by another route only  $14\frac{1}{4}$  miles, but by the river it is above twice that distance.

The expense of taking a barge of 120 tons burthen from Monkey Island to Reading, has been proved, before a committee of the House of Commons, to be 50*l.* and the passage cannot be performed in less than three days, and often three weeks, and it has even been known to have been two months; whereas, by a canal, it may be performed at all seasons of the

year, excepting a very hard frost, in six hours, and at the expense of only 4 *l.* 7*s.* supposing the tonnage to be laid at  $\frac{1}{4}$ *d.* per ton per mile, as is proposed.

By the river, the distance can never be shortened, nor can the labour of passing against the stream be avoided. It is confessed likewise, that no method can be discovered to make the river navigations passable in time of floods, which in most years continue for several months during the winter.

As no private property should be allowed in the canal (the money being intended to be raised by annuities), it is presumed the proposers will have every inducement to make ample satisfaction for injuries to individuals, nor is it possible they can have any motive to the contrary.

No private person can receive any benefit that is not common to the public ; therefore the public only are interested in this useful design, as this canal is intended to be a free navigation after the tolls have paid off the expenses of making it, and a sufficient fund has been accumulated to keep it in repair, which it is apprehended will be in less than 40 years.

Notwithstanding these arguments are not to be confuted, yet some individuals, pretending their private property would be injured, the country drowned, and raising many other weak and absurd objections, have found means (in a great assembly) to have this useful scheme rejected. But it cannot die ; for its merits must certainly one day or other revive it. I hope my readers will not be offended at my informing them of what may be done, as well as what has been done, with respect to the river Thames ; for although

some of these plans have not yet been executed, yet when the different canals in the interior parts of the country are completed, and the benefits and advantages derived from a communication between those great sea-ports Bristol, Liverpool, and Hull, which are happily now united by an inland navigation, shall have become generally known, it is very improbable that the city of London, the first city in the world for commerce, will tamely lie idle, and not take advantage of the opportunity to come in for her share. Indeed it is an unpardonable fault somewhere, that London did not take the lead, and set the example in a work of such great national importance, and not suffer a few interested individuals to oppose a scheme of such magnitude, but make a vigorous application to parliament, which no doubt will view the advantages of the plan in their proper light, and not suffer the public good to be obstructed by private individuals, but rather take example by the wise regulations of China, where not even the emperor's gardens or pleasure grounds are sacred from a public canal.

#### INTENDED CANAL FROM READING TO ISLEWORTH.

At a general meeting holden at the Town-hall at Reading, on Tuesday the 9th of October 1770, it was agreed, that a canal should be cut from Sunning to Monkey Island, and that no person whatever should be injured thereby. It was also agreed, that the river Thames from Sunning to Boulter's Lock should be amended at the expense of the canal, without any other toll being taken upon the river than what is now taken. At another meeting at Reading it was resolved, not to come to Monkey Island; but



to go into the Thames at Boulter's Lock, which would have been equally convenient for the continuation line to Isleworth.

At the same time it was agreed, that the money should be raised by life annuities; and when the tolls collected should have paid the expenses of cutting the canal and repairing the river, and when a sufficient sum should be accumulated for the perpetual repair thereof, that then the navigation for ever after should remain a free navigation.

And at another meeting held on the 7th of November 1771, at Reading, it was further agreed, that the said canal be of such dimensions as to admit the largest barges now navigating the river Thames to Reading, to pass and repass in every part.

When the design of this canal was laid before the city of London, a committee was appointed to examine and enquire into the utility of such a measure, and every proper step has been since taken to extend it. Plans have been made, and estimates prepared, both for making a canal from Isleworth to Monkey Island, and also for repairing the river from Monkey Island to Mortlake, in the county of Surry; so that the application of the commissioners for repairing the river by an additional duty on coals, seems to be precluded, because the river will be repaired without any expense to them, and without any additional toll upon the river; the consequences of which will be, that all the trade upwards will pass on the canal, because that being still water, and the distance shortened, the expense and labour will be greatly reduced; and most of the trade downwards (except in time of floods) will be by the river, because the barges and

boats will fall down the stream without labour, and save the expense of returning by the canal. In consequence of the increase of navigation, the river will have a much greater trade downwards than ever it had before, and the canal will be less obstructed by vessels returning to London; and it being intended to be of such dimensions as to receive the largest barges navigating the Thames westward, it is supposed it will not be possible for any person whatever to be injured by it. For by Mr. Brindley's first report it appears, that the expense of taking up a barge of 100 or 120 tons from Isleworth to Sunning, and back again by the river, is 80 *l.* and sometimes more, which by the canal may be done for 16 *l.* so that there will be a saving in expense of 64 *l.* out of 80 *l.* without noticing the great difference in time \*, or damage of goods, and disappointments by long droughts in summer, and floods in winter, incidental to all river navigations.

From what has been said it will appear, that the most expeditious passage for all vessels going upwards to Henley and Marlow, would be to pass the canal to Sunning (which may be done in one day with the largest barges), and fall down the river to Henley and Marlow, without labouring against the stream; and as a lock would be placed below Monkey Island, for the better crossing the canal, which will make level water, and consequently an easy passage up to Maidenhead and Boulter's Lock.

\* For by the canal the voyage may be made in 15 hours, whereas by the river they are three weeks in going up, and nearly as long in coming down.

A branch of the canal is intended to fall into the river about Windsor-bridge, for all vessels going from London to Windsor, Datchet, Old Windsor, &c. ; and a branch also is to be cut from West Belfont to Staines, Laleham, Chertsey, Weybridge, the Guildford navigation, Sheperton, Sunbury, &c.

As for the more easy passage from London to Brentford, Isleworth, Richmond, Twickenham, and Kingston; a good towing-bank will be brought down as far as Mortlake ; and a dam will be made with cistern-locks, to keep the banks always full to high-water mark, which will preserve level water up to Teddington. By this means most vessels will be able to reach Mortlake in one tide from London, and will be sure of an easy passage and level water into the canal ; an improvement which will make the whole country above it the most delightful spot in Europe.

Any person, by inspection of the country and course of the river Thames, will discover at first sight the great utility of this undertaking ; for, by carrying the eye in a straight line from Maidenhead to Isleworth, it will be perceived that the navigation will be shortened two parts in three.

To give the profile or section of the river (which I have now before me) from Mortlake to Boulter's Lock, near Maidenhead, with all the deeps and shallows, would be too tedious, and of little utility here. But the different falls or descents of its surface at Boulter's Lock may be useful and worthy notice. The water above the lock is above five feet deep ; but below, the vast force of the water coming down from such an unmechanical lock, has worked or dug a hole of 20 feet perpendicular depth, and above 100

feet in length; beyond which rises a hill thrown up by the great force of the current, where the bed of the river has little more than three feet depth of water.

The whole fall from Boulter's Lock to Mortlake is 75 feet 7 inches, and the distance is 41 miles 1 furlong. This survey and measurement was taken for and by the order of the city of London, in the most accurate manner, to shew the impossibility of making a good navigation in the bed of the river, or any other where the fall is so great, as has been proved by sad experience in many instances. It may not perhaps be foreign to this business, or amiss at this place, to mention a few among several.

The river Avon, from Salisbury to Christchurch, was made navigable, and was opened but a very short time before it was entirely destroyed by the floods, and it has not yet been thought worth while to repair it. There is some intention, I am informed, to make a canal parallel with it. The river Stour, from Stourbridge to the Severn, has undergone the same fate. The navigations of the rivers Mersey and Irwell have had most of their works destroyed by the rapidity of the floods. And the navigation of the river Calder in Yorkshire, about the year 1774, was very greatly damaged, and rendered impassable for above twelve months, and then repaired at a very great expense; but it and all others still remain exposed to the same danger,

### INTENDED CANAL FROM LONDON TO WALTHAM ABBEY.

Before I quit the metropolis of the British Empire, I will give some short account of an intended navigable canal from Waltham Abbey, in the county of Essex, into a large basin, to be cut in Moorfields, London—a most noble improvement, projected and promoted by Mr. James Sharp, for the advantage and ornament of the city of London.

Mr. Sharp, having conceived the idea of a grand canal of communication between London and the adjacent country, made choice of the area of Moorfields, as the extreme point to which it might be most commodiously directed. With this view, about the year 1772, he caused the level to be taken from the quarters of Moorfields, in order to try where it would run into the river Lee, when, to his surprise, he found it extend no less than  $13\frac{1}{2}$  miles, and to approach so near to Waltham Abbey as to make that place the other extreme point from whence it might proceed. In the course of this survey it was observed, that such a canal would in its progress pass through a very pleasant part of the country, through every capital village in the course of its direction, and through inclosures, the richest and most delightful rural prospects that can be conceived.

Mr. Sharp employed the ingenious Mr. Robert Whitworth to take the survey, who was draughtsman to the late celebrated Mr. Brindley, and who assisted in projecting most of his magnificent works.

This gentleman, upon trial, found the project of Mr. Sharp not only practicable, but much more easy to be carried into execution than in most countries

through which navigable rivers have been made ; and according to his calculation, a canal 60 feet wide at the surface,  $4\frac{1}{2}$  feet deep, and terminating in a basin 400 feet long, and 200 feet broad, in Moorfields, might have been completed from Waltham Abbey, for the sum of 52,495 *l.* a sum inconsiderable in comparison to the advantages that would accrue from it to the city of London, but more particularly to the country through which it was intended to pass, every foot of which adjoining to its banks would be greatly increased in value.

Upon this representation of the facility of carrying this design into execution, Mr. Sharp thought proper to proceed, and caused a plan to be prepared and laid before the common council, in order to take the sense of that body in a matter that so highly concerned the city of London. It was some time before the plan could be completed ; but it was no sooner seen than approved, and a petition was presented to parliament, for leave to bring in a bill to enable the city to carry it into execution.

Previous to this presentation Mr. Whitworth was desired to consider of the manner of conducting the canal, and the application of it to the most beneficial purposes, as well with respect to health and ornament as utility.

He was given to understand, that the quarters of Moorfields were set apart as a pleasure-ground for the citizens of London to walk in for the benefit of the air ; he therefore very judiciously contrived, not only to secure to them that privilege, but to heighten the pleasure of the enjoyment ; he proposed to surround the basin with a spacious gravel walk, by which any number of persons might amuse themselves by the

sides of the silvery surface, which no doubt would have been filled with vessels of various construction, as none were to be admitted but boats for pleasure, except only those for carrying light goods and passengers to and from the country. For besides the smaller basin in Moorfields, which was intended chiefly for pleasure, Mr. Whitworth had projected one of a more ample construction, of a circular form, 500 feet in diameter, to be laid out between the field near Holywell Mount and the Tabernacle, with wharfs extending 80 feet every way from the water's edge, skirted round with buildings for mercantile purposes, which would have amazingly increased the trade of the city, and have produced many great advantages, some of which are as follows.

Health is considered as the first and greatest advantage; and that would be promoted in an eminent degree by a constant circulation of free air, occasioned by the passing and repassing of vessels for pleasure and business upon a clear stream, and by constant communication with the country.

Next to health the advantage of supplying the city more copiously with provisions, the most likely means to reduce the price. Milk in particular, which is now of a very bad quality, owing to the rank food of the cows in the suburbs, would then have been brought twice a day, by water, from cows fed in meadow-lands with wholesome grass, instead of grains and cabbage-leaves.

Butchers' meat, in like manner, would have been brought from places remote from town, where cattle would have been slaughtered without being heated with over-driving, and consequently fitter to be preserved in salt.

Corn, malt, and flour, at a small expense, would have speedily been brought from Ware, Hertford, Stortford, and other towns and villages at a greater distance, without being loaded with the expense of double carriage; and coals, and other heavy articles, would have been returned nearly as cheap as those sold in London.

Hay, straw, coals, brick, chalk, lime, but more particularly timber, would have been capital articles of traffic on this canal.

The number of horses would be greatly diminished, in proportion as the quantity of those heavy goods brought by water should be increased; so that the saving of provender would be a considerable object.

The conveyance of passengers by water, in vessels properly furnished, from one end of the canal to the other, at the small fare of 3*d.* would not only be of great convenience to passengers in general, but more particularly to those who might be inclined to collect and bring to market the small articles of poultry, butter, eggs, &c. A large reservoir of water would be always ready for extinguishing fires in every part of the city. By means of channels or pipes of communication, the filth of the city might all have been carried off from the common sewers, at times when abundance of rain might make water plenty. These, and many other advantages, would have accrued to the city of London from the completion of this plan.

To the proprietors of land, and to the inhabitants at a distance, the advantages would have been proportionably great. Fields would have been converted into gardens, and wastes into fertile fields, by



means of the plentiful supply of manure, and the penury of the poor country labourers relieved by the profusion of the city.

#### LEEDS TO SELBY.

The first and most obvious advantage of a canal is, that its navigation is equal and regular; for it is not so certain that a waggoner arrives at his inn at a stated hour, as that a vessel floating on a canal will arrive at a stated time at its place of destination. The time will always be certain, and, if the canal be properly formed, always be less than that required to navigate a river. The saving in point of time will be of the utmost importance to trade; and as the business which requires 10 days in performing upon the river Air, will more frequently be done upon the canal in as many hours, if the difference of freight bear any kind of proportion to the difference in the time, the saving in that article also will be very great.

An artificial cut will be drawn with fewer curves, and will have no stream either way to oppose the vessels. By shortening the carriage, a valuable improvement will be made; and such is the improvement which the canal now projected will produce, by which, although it is only 23 miles in length, the passage from Leeds to Hull will become six miles shorter, and the passage from Leeds to Selby, Tadcaster, York, &c. 30 miles shorter than it now is.

In the reign of King William III. when trade in this part of the country was far below its present state, it was thought proper to facilitate communication by water-carriage; and an act of parliament was passed, by which certain lock-dues, or rates of tonnage, upon the rivers Air and Calder, were granted for the en-

couragement of those who had undertaken to make and keep them navigable, amounting to no less than 16*s.* per ton from the first of October to the first of May, and 10*s.* per ton from the first of May to the first of October: rates which, if they were now to be exacted, would, even without the addition of freight, often exceed the price of land-carriage, and in many cases exceed the original value of the goods transported, and in a great measure put an entire stagnation to trade itself: yet these rates are now legal, and any abatement must be considered a favour.

By the length of passage, they may evidently be carried at a cheaper rate; and as water-carriage is preferred to land-carriage merely for its cheapness, the same reason makes one mode of water-carriage preferable to the other.

To mention the increase of trade in general terms, is to convey no distinct or accurate idea; it is necessary therefore to state particularly, that, by the yearly accounts of the number of woollen cloths made in the West Riding of the county of York, and given in to the justices of the Easter session 1772, it appears there were made, the preceding year, 112,370 pieces of broad cloth, measuring 3,223,913½ yards, and 95,539 pieces of narrow cloth, measuring 2,377,517½ yards, amounting in value, reckoning the broads at 5*s.* a yard, and the narrows at 4*s.* to the sum of 1,281,481*l.* 13*s.* besides which it is apprehended the stuff-trade carried on in Yorkshire, and the cloth and woollen trade carried on in Lancashire, of which no certain account can be obtained, are of much greater value than the cloth made in the West Riding.

Cloth, or the materials for cloth, are not the only things in such a country that require easy and expeditious transportation. Timber, stone, coals, lime, and provisions, whatever is necessary to the support or accommodation of great numbers of wealthy and diligent inhabitants, whom successful trade always brings together, and whatever is supplied by an extensive country, various in its products, which may be useful to other parts of the kingdom, are always passing and repassing in this populous and busy province, in which a capital of many millions is constantly employed : and that all those would pass and repass with more certainty, and at a less price, by the canal now proposed, than by that now in use, is self-evident ; notwithstanding which, the opposition it has met with from those interested in the Air and Calder navigations has defeated the project, and rendered a laudable attempt to serve the public, after a very considerable expense, of no effect.

The proposed route of this canal at once proves its utility. It was intended that it should communicate in the township of Holbeck with the canal now making from Leeds to Liverpool, pass from Holbeck by Leeds to Hunslet, and by Thwait Mill, thence cross the river Air near the fire-engines, not far from Newton, and proceed by Fairburn, with a tunnel through the hill near Burton Salmon, by Hilham and Hambleton, near Thorp-hall and Thorp-dam to Selby, into the river Ouse, and immediately down to Hull.

A short cut has been made from Selby into the Air and Calder navigation, near Haddlesey, by which there is an easy conveyance to Leeds ; and it is hoped most or all the advantages expected from

the before-mentioned canal are now enjoyed by the public, and the old adventurers in the river navigation are certainly not injured, but benefited.

#### HUDDERSFIELD CANAL.

Before I begin to describe the Leeds canal, it will be proper to take notice of a canal intended to go from Huddersfield in Yorkshire, to Cooper's Bridge over the river Calder, where the roads go off to Leeds and Wakefield.

This canal is to begin at King's Mill near the town of Huddersfield, and pass Bau's Lane and Townswell's Spring, crossing the high road to Halifax, and Houghditch and Black-house Brook near Deighton, upon the edge of Ladgrave Wood, to Cooper's Bridge. The length is near eight miles, and the fall is 56 feet 10 inches, by nine locks, equally divided for the fall. This canal was first surveyed in 1766, and again in 1773, by Mr. Luke Holt; and in 1774, an act passed to enable Sir John Ramsden, baronet (who is the sole proprietor of the town of Huddersfield), to complete it. By its junction with the river Calder at Cooper's bridge, it will open a communication with the great trading towns of Halifax, Wakefield, Leeds, York, and Hull. Stones, slates, flags, lime, lime-stone, or coals, carried on this canal, to pay 8*d.* per ton, merchandise 1*s.* 6*d.* per ton, and no toll to be taken for dung or manure.

There is a clause in this act, that the clear profits to be received from this navigation shall never exceed six per cent. upon such monies as shall be actually laid out in making, maintaining, &c.

N. B. . . This canal has been made and completed some years.

## LEEDS AND LIVERPOOL CANAL.

A navigation between the east and west seas, by the rivers Air and Ribble, was for many years deemed a practicable and desirable work by several gentlemen of speculation and public spirit; and some endeavours were used by them, at several periods, though without effect, to draw the public attention towards it. While this great design was in contemplation, the Duke of Bridgewater formed his plan of a navigable canal from Worsley Mill to Manchester; which he soon after executed with great ability and success. Works of genius generally draw the attention of men of genius: Mr. Longbotham, therefore, having viewed and examined the route of this canal, and the manner of carrying it into execution, in 1767 conceived the noble design of this canal from Leeds to Liverpool; and to be thoroughly satisfied whether it was practicable or not, he took an actual survey of all the intermediate country between those two extremities, and produced a plan, with an estimate of the expense of executing it, at several public meetings, which were called at sundry times and places in the counties of York and Lancaster. At several of these meetings, composed of the gentlemen and land-owners lying near the canal, it was unanimously resolved, that the scheme was practicable, and, if executed, would be of great service to the country: and to put the question beyond a doubt whether it was practicable or not, it was agreed to call on Mr. Brindley to take a survey; a gentleman whose surprising success in executing works of this kind, has justly entitled him to the highest credit and esteem.

Mr. Brindley, after surveying by himself and his agent the whole course as laid down by Mr. Longbotham, reported to two numerous meetings of gentlemen, merchants, and manufacturers, held at Bradford the 5th, and at Liverpool the 9th of December 1768, that it was very practicable, and might be executed at an expense which he produced in a particular detail of all the works, and estimates of them, which is too long to particularise here, but of which the following is a summary account :

Mr. Brindley estimates the whole expense of making the proposed canal from Leeds to Liverpool, being  $108\frac{3}{4}$  miles, upon a plan of 42 feet wide at top, and 5 feet deep, at..... £259,777

The interest of which, at 5 per cent. per annum, will amount to near ..... 13,000

The expenses of keeping it in repair, the salaries of officers, losses, and unforeseen accidents, he estimates at .... 4,000

Making together, per annum ..... £ 17,000

The tonnage will at least make as follows :

Lime-stone, lime, slate, flags, bricks, and free-stone, at a halfpenny per ton per mile ..... £8,500

Coals at one penny per ton per mile ..... 3,500

Lead, iron, deals, timber, hemp, flax, Hamburg yarn, woollen, linen, and cutlery goods of all kinds, groceries, dying wares, salt, mahogany, wine, Burs-

Carried over.... £ 12,000.

|                                                                                |          |
|--------------------------------------------------------------------------------|----------|
| Brought over . . . .                                                           | £ 12,000 |
| lem wares, spirituous liquors, corn, butter, cheese, Irish yarn, alum, &c. &c. |          |
| at one halfpenny per ton per mile. . . .                                       | 8,000    |
|                                                                                | <hr/>    |
| Total                                                                          | £ 20,000 |

These are the calculations on which this undertaking is founded ; it is now to be considered, whether the advantages which may probably arise from this canal will equal the expense of making it.

First, Those which will accrue to the particular country through which the canal passes.

Secondly, Those which will accrue to the kingdom in general.

And first, the advantages which will accrue to the particular country are :

1. It will make the mutual exchange of the native productions and commodities of one part of that country for those of another, easy, expeditious, and cheap.

2. It will greatly promote and increase the trades and manufactures carried on in it.

3. It will improve the lands, and increase population.

4. It will save an enormous expense of land-carriage.

Whoever takes only a superficial view of the intermediate country between Leeds and Liverpool, will find that some parts of it abound with the best coal, but are destitute of lime-stone ; while in other parts he will find inexhaustible rocks of the best lime-stone, but a total want of coals. In others he will find fine slate, flags, and fire-stone lying useless

and neglected, and of no kind of value, on account of the prodigious expense of land-carriage, although they are much wanted on the whole course of the canal. In some parts there is great plenty of timber fit for ship building, and great quantities of wood proper for common buildings, and making tools and utensils in husbandry, as also for making charcoal and other purposes; while in others scarcely a single tree, unless planted for ornament, is to be seen for many successive miles.

In a great part of Craven and Lancashire, the whole country, for many miles together, consists almost solely of pasture, and a very small portion of meadow-land, and is employed in raising and feeding cattle only; insomuch that the landlords generally restrain their tenants and servants from using the plough. Their corn for bread, and every other use, they are forced to get at a great expense by land-carriage.

From this cursory and imperfect sketch of the country it is visible, at the first glance, what general and extensive advantages will accrue to the whole adjoining country from this canal; which will, as it were, connect the whole, and make every part partake, at an easy expense, of the natural and acquired advantages and conveniences of the rest.

Coals will be carried to burn the lime-stone throughout Craven; and the lime-stone will also be carried from thence, and coal brought from the coal-works adjoining to the canal.

The slate, flags, and free-stone that now lie buried and useless, will be brought to light, and not only supply those parts of the country where they are wanted, but will also be carried coastwise upon both



the east and west seas, even as far as London, as they are now brought from near Leeds and Halifax by water carriage.

Timber for building ships and houses, and for various uses in husbandry, and in several branches of manufactures produced by those parts where it abounds, would plentifully supply the wants of other parts where it is both scarce and dear; and Craven, and the adjacent parts, where little or no corn is grown, but where great quantities are and must be consumed, will be eased of the excessive burden of land carriage, and will be constantly and plentifully supplied with that necessary commodity, by this water carriage, from the market at Leeds on the one hand, and from what is called the file country in Lancashire on the other.

These are a part, and but a small part, of the very great and numerous benefits which will arise to the whole intermediate country, by the mutual exchanges of the native productions and commodities of one part for those of another.

2. It will contribute very much to promote and increase trade and manufactures.

We know from constant experience, that nothing contributes more to the encouragement of trade and manufactures, than the facility of conducting them, procuring the proper materials for them, carrying the goods manufactured to a market, and obtaining a certain and uniform subsistence for the manufacturers.

Now all these advantages will be derived from this canal. A constant, ready, cheap, and certain conveyance of every species of goods from one place to another will render the management of trade easy,

and will also supply the manufacturers with variety of materials ; as Irish yarn and wool, cotton, indigo, dying goods, and other materials, and at the same time will provide a constant and uniform plenty of subsistence, as the market will be as it were at their own door : corn, potatoes, garden-stuff, and other provisions, will be continually passing and repassing on the canal as markets fluctuate, and the scarcity of one place or market be supplied by the superfluity of another.

3. It will greatly improve the lands, and increase the population of the country.

Lime, when used with judgment, is one of the best manures for land, and by means of this canal may be had in great plenty, and very cheap, from one end of the canal to the other, and for six miles or more on each side of it, to the great improvement of this large tract of country ; in several parts of which little lime can be had. Besides this, marle and other manure, particularly foul salt, may also be had by means of this canal, in many parts of this country, which now cannot procure them. And that population will be increased, is evident from what has been said before ; for where manufactures are encouraged, where there is plenty of work, and plenty of wholesome provisions, population always must and will increase.

4. It will save an immense expense in land carriage.

This will appear evident, if the present price of land carriage be compared with the price proposed to be taken for the water carriage. The price of land carriage is at present on an average 1s. per ton per mile. The price proposed to be taken by water, for

tonnage, freight, and all incidental expenses, is, for merchandise, 2*d.* per ton per mile; for coals, 1½*d.* per ton per mile; for lime-stone, lime, slate, &c. one penny per ton per mile, being only one-twelfth of land carriage. Thus, upon a medium, at least seven parts in eight of the land carriage will be saved to the public.

To know how much this saving may amount, it is not easy to say with any degree of certainty; but if the profits to arise from the navigation is, as before mentioned, truly calculated, and by those who know the country best it is deemed to be rather below than above the truth, this saving will amount to above 200,000*l.* a year.

Besides these advantages, there is another arising from time, or from the certainty and expedition of this mode of conveying goods and merchandises from one place to another; an advantage well understood by all traders and manufacturers. For let us suppose a proper number of deck boats, built after the manner of the Duke of Bridgwater's, divided into three or four convenient rooms for passengers and merchandise, of which one should set out from Leeds, and another from Liverpool, every morning at a certain stated hour, and making short stays in their passage at certain stated times and places to take in and discharge goods and passengers, these great towns, and the whole intermediate country, would thus have a constant, safe, cheap, and commodious conveyance of goods and passengers from place to place; and the whole passage from Leeds to Liverpool, and *vice versâ*, might be completed in three days.

But advantages no less great, and by far more extensive, will arise to the trade and manufactures of

this kingdom, by opening this short, expeditious, and safe communication between the east and west seas. The whole intermediate country between Leeds and Liverpool, and for a large extent on each side the canal, will be supplied with wool, woollen yarn, corn and provisions, hides, tallow, &c. from Ireland, and also the produce of America, and whatever else is imported at Liverpool; and the same countries will also be supplied with linen, linen yarn, tin plates, deal, timber, iron, boards, hemp, flax, Russia linen, potash, and whatever else is imported from the east country at the port of Hull, and in like manner all our exports would be encouraged and benefited. And this may seem to affect this country in particular, by promoting its manufactures and improving its lands; yet the whole kingdom will share in this improvement, and the encouragement of these manufactures, which annually bring in not less than 2,000,000*l.* sterling; besides the advantage of this internal navigation from east to west, without which vessels would be obliged to go round the island *two thousand miles or more*. In time of war, likewise, this communication will be a prodigious advantage to the whole trading interest. Upon the whole, the many advantages arising from this navigation from sea to sea are so many, and so various, and of such prodigious value to the kingdom in general, as well as to these counties in particular, that it is difficult, if at all possible, to form a just idea of them.

The small objections made to this canal prove its utility, and were so futile as to need no reply. The act was obtained without opposition.

Parliament granted the act for carrying the canal into execution in the beginning of the year 1770, and it was begun the latter end of that year; and such was the expedition made in the work, that, at a meeting held at Liverpool by the proprietors, the 27th of September 1771, an account was delivered in by the engineer, that there were upwards of 20 miles of it not only cut, but also nearly finished.

In order to make the expense, and raising the money as easy as possible, it was agreed to petition the legislature to have the powers vested in a company, and to divide the capital into 2600 shares of 100*l.* each, and to bear an interest of 5*l.* per cent. to be regularly paid on a stated day in every year, till the work should be completed; when the full profits were to be equally divided annually, in proportion to the shares of which each person was possessed. And that each subscriber should have a vote upon all occasions by himself or proxy, for every share; and that no person was to be allowed to hold more than 100 shares, which would be a security against any partial or injurious influence in the execution of the works, or management of the company's affairs when completed.

I shall now proceed to describe the course of this canal, its length, rise, and fall.

This canal begins out of the river Mersey, at low water, just at the lower extremity of the town of Liverpool, by Bank-hall, Bootle, Litherland, and makes almost a half circle, and goes over the river Alt to Melling, by Maghul, and Aughton and Mill-house; it then takes a large half circle round the town of Ormskirk, and crosses Toad-brook near Newbrough, which it passes, and crosses also the

river Douglas (which runs to Wigan), proceeds by Bisburn-hall and Monk-house, and crosses the river Yarrow at the town of Ecclestone. It then goes on by Shaw-green, Colebrook, and Shaw-mill to Leyland, over the brook near Bamber-bridge, and soon after crosses the Lancaster canal near Houghton-tower and Fleetwood-hall, over the river Darwent by Showley and Dewhurst, crosses the river Calder near Whaley, by Padiham and Pendle-hall, and again crosses a part of the river near the town of Coln to Foulridge, where a bason is cut to supply the canal, of which it is the head. The canal here begins to fall to Leeds, and goes from Foulridge by Salterford, East Marton, and crosses the river Air near Gargrave, by Thorlby, Sturton, and the town of Skipton, by Bradley, Kildwick, Silsden, near the town of Keighley and by Bingley; a little below which it again crosses the river Air, passes Shipley, and takes a semicircle round Idle, near Appertin-bridge, Horsforth, Kirkstall-abbey, by Burley and Holbeck, to the town of Leeds, making in the whole a course of 117 miles, with 838 feet fall, viz. From the summit near Coln to Leeds, 45 miles; fall, 409 feet. From Coln to Newbrough, 44 miles; fall, 429 feet. From thence to Liverpool, 28 miles, and is level. At Foulridge is a tunnel 1609 yards long. There is also a collateral cut from near Shipley to the town of Bradford.

The above is the line for which the act was obtained; but since then, many reasons have arisen to shew that it would be materially for the advantage of the subscribers and of the public, to deviate from the line originally proposed, and carry it through a part of the country more populous, viz. from New-

brough, by the Douglas navigation, to Wigan; from thence in a circular course through Red Moss, by Blackrod, north for some way parallel with the Lancaster canal near Chorley, and by Heapy to Blackburn; from whence, with a bend round Church to Burnley, there joining the former line; and for many weighty reasons, it is presumed that application will be made to parliament for leave to pursue this course as the more highly advantageous.

By this new line the distance and fall will be as follows: From Leeds to Coln, the same as before mentioned. From the summit there to Wigan 50 miles, with 399 feet fall. From thence to Liverpool 35 miles, fall 30 feet; making in distance 130 miles, with 838 feet fall.

#### LANCASTER CANAL.

An act of parliament has been obtained for carrying this survey into execution, and the preamble states: "Whereas the making and maintaining a navigable canal for boats, barges, &c. from Kirkby Kendal, in Westmoreland, &c. &c. will be of considerable advantage to the lands and estates in the neighbourhood thereof, by making communications from the extensive mines of coal at the southern extremity of the said canal, to the inexhaustible quantities of lime-stone at the northern end thereof, of both which articles all the intermediate country is greatly in want; and also by uniting the port of Lancaster with so large a tract of inland country (wherein very extensive cotton and other manufactories are carried on), very considerable advantages will be derived; and, moreover, will in other respects be of

great public utility, &c. &c." The advantages being thus clearly pointed out, it remains only to give

The course of this canal, which is nearly due north. It begins at West Houghton, from thence to near Wigan, along the course of the river Douglas, by Chorley, Whittle, and near the road from Wigan to Preston intersects the line of the Leeds and Liverpool canal; from thence crosses the river Ribble to Preston; from whence by Spital Moss it makes a bend to Salwick, by Barton, to Gastang, where it crosses the river Wyer, and thence to Lancaster; then running by the side of the town, it crosses the river Loyne above Skerton, to Hest, Bolton, Carnforth, by Capanway Hall, and passes Burton; from thence by Hang-Bridge, through a tunnel near Leven's-Park, to Kendal. There is a collateral cut from Gale Moss by Chorley to near Duxbury; the length near three miles, and level: and another from near Borwick by Warton, to Warton Crag, two miles and a half long, and level. The feeder is one mile from the bason at Kendal, and is supplied from the river Mint.

Of the length, fall, &c. of this canal, the following are the particulars: From Kendal to Greenhead Farm, five miles one furlong, and level. From Greenhead Farm to near Borwick, nine miles one furlong, with a fall of 65 feet. From Borwick to near Preston, 42 miles 5 furlongs, and level. From thence to Clayton Green, three miles with 222 feet rise. From thence to West Houghton, 15 miles 5 furlongs, and level; making the total length near 76 miles, with a rise of 222 feet, and a fall of 65 feet. The collateral cuts together make  $5\frac{1}{4}$  miles, and are level.



A survey for this canal was made in 17<sup>th</sup> 2 by Mr. Robert Whitworth; but as that scheme was not pursued, it is needless to state further particulars of rates of carriage, breadth and depth of the canal: the money to carry it into execution and complete it was estimated at 414,100  $\text{£}$ . to be divided into 100  $\text{£}$ . shares, and liberty to borrow, if wanted, 200,000  $\text{£}$ . more.

The course of this intended navigation is well worthy attention.

From the extremity of this canal, at Kendal in Westmorland, it is carried on by the town of Lancaster into the Leeds and Liverpool canal, down to Liverpool, from thence up the river Mersey into the duke of Bridgewater's canal as far as Preston-brook. There the Staffordshire canal breaks off, which joins the river Trent to the Severn; but the navigation to London is still carried forward by the Coventry canal, which continues the line to where the Oxford canal commences, which continues it to the river Thames, and by that river it is brought forward to London; being a course of inland navigation, reckoning all the windings, of very near FIVE HUNDRED miles extent.

If these vast undertakings are considered as accomplished by private adventurers, perhaps there are none such of equal extent to be found in the whole world (for in other countries they are generally completed by the government); and yet we have no reason to believe that the cutting of canals is yet (1791) at a stand in England. There are still many tracts of country that may be advantageously connected, and probably will be so in a few years. The junction, for instance, of the rivers Nen and Avon,

by a canal from Northampton to Newbold or Rugby, which would join the Nen and the Severn in a direct line, and the Nen and the Thames collaterally, is an undertaking, the expense of which would be very inconsiderable, in comparison with that of other navigations that have been lately completed.

A canal navigation from Biggleswade in Bedfordshire to Hertford, to join the river Lea navigation to London, is an event much to be wished, as well for the country as the metropolis.

A plan has been suggested for uniting by the Brandon river the Lynn navigation, which already is carried to Cambridge, to the river Lea and Stortford navigations, which are now navigable from London to Bishop-Stortford. This canal was intended to go from Stortford to Saffron-Walden, thence by Linton to join the Brandon river, with a cut from thence to the Burwell, or Reach Lade, near Newmarket, which was estimated to cost 175,000 *l.* and a bill was brought into parliament in 1790, but immediately rejected, as it would have entirely taken away the trade between Lynn and Cambridge, and have transferred it to London. The author of this history was consulted by the gentleman \* who carried in the bill,—but not till after it was carried in.—He foretold him its fate; but the gentleman having large property in the Stortford navigation, and its neighbourhood, and being a member of parliament, with extensive connections, persisted in his scheme, but the bill was thrown out on its first reading.

There have been several attempts to join the Stortford and Lynn navigations at Cambridge, but the two

\* George Jackson, Esq. Member of Parliament for Colchester, Essex.

noble owners of Audley End and Shotgrove, through whose parks the rivers or streams run, have always opposed it, and rendered abortive every attempt for so valuable a communication.

The author of this history has pointed out a course such a navigation might take, by carrying it near the town of Royston, when the trade of that town and neighbourhood would be easily conveyed to London, Cambridge, and Lynn, by water carriage. By this line all the objections which have been made to this navigation from those noblemen, and the town and university of Cambridge, who opposed the petition to parliament in 1790, would be entirely avoided; and as its utility cannot but be manifest, I make no doubt there would be more petitions in its favour, than there were before against it. The expense would be little more than 20,000 *l*.

I am willing to entertain hopes that government will undertake the cutting of a grand canal from the river Thames to Southampton, and consequently to Portsmouth; by which a certain and expeditious communication from the metropolis, and the dock-yards of Deptford, Woolwich, Sheerness, and Chatham, may be obtained, without ships being obliged to go round the Foreland, the Downs, and down Channel, against tempestuous or adverse winds, in time of war; and the convoy which is usually employed on that service, may be used for other purposes, as all the victualling stores, and other articles may go by this canal.

And as canals are now completed from Redbridge to Andover, and from Basingstoke to Weybridge on the Thames (which have long been objected to by interested persons, but the public good having pre-

vailed over private inconvenience), we may soon expect to see the noble oak timber in the interior parts of Hampshire and other adjoining counties, almost useless on account of the heavy expense of conveying it to the dock-yards, brought by cuts branching out of and from the canal, by a cheap and ready conveyance, to places where the want of it has been for years severely felt.

#### BASINGSTOKE CANAL.

A canal from Basingstoke was first proposed in 1772, and a petition was then presented to parliament; but it was not intended to communicate with the river Wey near Weybridge, but with a canal that was then proposed to be made from Reading to Monkey Island, near Maidenhead, in the river Thames, by the corporation of Reading, and from thence to be continued by the corporation of the city of London to the river Thames at Isleworth; but through the opposition of the land-owners, and other gentlemen, who had not discernment enough to see their own interest, the scheme was frustrated.

But the plan now executed experienced a more favourable reception from the land-owners; for, out of the great number of proprietors of land, through whose lands this canal passed in a course of 37 miles, there were but two dissenting voices.

This canal promises to be of great public utility, by furnishing an easy conveyance to the London market, and to the public dock-yards for vast quantities of timber, which at this time lies useless in the country for want of such conveyance.

The canal begins at Basingstoke, from the little river Loddon, and at a place called Newman Springs,

by the village of Basing; thence passing round and across the road at Newham, and straight by a tunnel into the little river called Deepford; whence it proceeds round Dogmersfield park to near Crookham, straight along by Aldershot, over Dradbrook, which divides the counties, and thence turns up to Colingley-moor, and returns by Purbright and Oak-farm into the river Wey, near the village of Westley. It is something more than 37 miles, with a fall of 195 feet in the last 15 miles, viz. from Dradbrook; the other being 22 miles, is level. There is a collateral branch over Hook Common to Turgis Green, of six miles, and level.

#### ANDOVER CANAL.

This canal was surveyed in the year 1770, and found to be practicable and easy, and in 1771 a petition was presented to parliament for leave to bring in a bill to carry this useful scheme into execution; but nothing was then done, on account of objections being made about the lands to be purchased, and the damages that might be sustained, although the advantages that would accrue to this part of the country are very considerable.

The scheme for this canal (now executed) was revised by Mr. Whitworth in 1789, certain objections were removed, and the whole made more agreeable to land-owners, &c. and an act was in consequence obtained: since which it proceeded with vigour, and was soon finished. No doubt can be entertained but this canal will answer the well-founded expectations of the subscribers and the public, unless the underhand proceedings of certain individuals should frustrate that hope; but this the spirit of the inhabitants

of the country will no doubt prevent. Monopolies are always inimical to public benefit.

This canal begins at Barlow's Mill, and takes in Pillhill Brook ; proceeds by Upper and Lower Clattford, Westover, and round the village of Fullerton, at Kitcomb Bridge, by Lakeford, and through the town of Stockbridge, by Park Farm, Mitchimus, and Tinsbury, by Great Bridge to the town of Rumsey ; and thence crosses the great road from Salisbury, to Winchester and Lower Ashford, by Grove-place, and Nurslin-street to Redbridge into the Hampton-water ; being a course of  $22\frac{1}{2}$  miles, and a fall of 176 feet 9 inches.

#### WINSTON CANAL TO STOCKTON ON TEES.

This canal was surveyed in 1768 by Mr. Robert Whitworth, and was intended to have been carried into immediate execution ; but a sufficient subscription could not then be raised, it being feared that the tolls for the goods that were likely to be carried upon it would not pay the subscribers proper interest for their money ; but these apprehensions have been so satisfactorily answered by some gentlemen who are well acquainted with that country, and have made moderate calculations of the prodigious quantities of coals, lime, and lead, besides other merchandise that would be carried on the canal, that it is now beyond a doubt that it will pay the undertakers as well as any canal made or now making in the kingdom, that of Birmingham only excepted (the tonnage of which amounts to more than 11,000 *l.* per year) ; and it is not clear whether this canal will not exceed that sum.

This canal begins at Winston (and the source of water three miles higher up), and running north to very near Staindrop, turns westerly to Killerby, by Legg's-cross to near Lower Walworth; from thence by Cockerton to Darlington, and across the high road to Durham, and also across the river Skern; and thence to Bank-top, and along Maiden-dale to the Fighting Cocks near Oak-tree and Moor-house by Cothams-Stob and near Hartburn, into the river Tees at Stockton; being a course of near 27 miles, with a fall of 328 feet.

There is to be a branch from the main canal, near Lower Walworth, to Pierse-bridge into the Tees, of one mile and three quarters; and another cut from Darlington to Croft-bridge on the Tees, of three miles; and another cut from Cothams-Stob to Yarm, near two miles; which together will make the completest canal in the kingdom.

#### CHESTER CANAL.

The course of this canal was surveyed in the years 1767 and 1769, and again in 1770, by several surveyors and engineers; and at the latter end of the year 1769, application was made to parliament for an act to complete the same by the corporation and gentlemen of Chester; but at that time they were unsuccessful. In the latter end of the year 1770, they applied again to parliament, and obtained an act; but with this extraordinary restriction, that the branch to Middlewich should not unite or communicate with the Grand Trunk. The canal was begun in 1772, and completed in a very short time, and is likely to be productive of great advantages to the

city of Chester, and also to the country through which it passes. The branch to Middlewich has not been carried into execution.

The course of this canal is out of the river Dee at Chester, across the main road leading to Warrington, by Christleton and Waverton, Hargrave, Huxly, and over Brassey-green, near Beeston-castle, to Tiverton; it then turns to the right to Hurleston, Acton, and Nantwich; going a course of about 17 miles. Its rise from Chester to Tiverton is 170 feet 10 inches; from thence to Nantwich is a dead level.

#### BIRMINGHAM CANAL.

This canal begins at Birmingham, and proceeds to Wilsdon-green and Smethwick, by Blue-gates, West Bromwich, Oldbury, over Puppy-green, by Church-lane, Tipton, and Bilston; by the skirts of the town of Wolverhampton, by Gosbrook-mill, near Aldersley, into the Staffordshire canal, which unites the grand trunk with the Severn; being a course of 22 miles, with a rise from Birmingham to Smethwick of 18 feet; from this place to Wolverhampton is a level; from thence to Aldersley there is a fall of 114 feet in the short space of one mile and three quarters. Out of this canal, at West Bromwich, there is a cut or branch which passes over Ryder's-green to the collieries at Wednesbury; being  $4\frac{1}{2}$  miles, with a fall of 46 feet.

The other canals to the several coal-mines and towns were surveyed in 1775. A canal begins about a mile from the town of Dudley, near the engines which are next Netherton-hall, and proceeds across Knowl-brook, and along Dudley-wood side through Urchill-coppice and Brierly-hill cop-



pice to Black Delft, and, taking a large circuit round Brierly-hill church, and across Brittle-lane, between the fire-engine and Seaton's engine, falls into a canal on the left of Brockmore-green, which comes from the right from Bromley fens and Pensnett-chace, where there is a large reservoir of water, for a head to the navigation, of near 12 acres. It then proceeds almost in a straight line to Wordsley, across the high road from Stourbridge to Hampton, along Wordsley-field, and across the river Stour, which runs up to Stourbridge, and runs on the left by Bell's mill, through Affcott-meadows into the grand trunk, at 34 miles from the Trent navigation, and 12 miles from the Severn. At the elbow and confluence of the river Stour with the river Smestall, very near Stourton, a branch goes off to the left by Wordsley-field, along Addenham-bank, by Woollaston, Holloway-head, round Sor's-hole, into the river Stour, at the extremity of the town of Stourbridge.

From the junction of the Wolverhampton canal to that of the Dudley canal, five miles, and the rise 191 feet 3 inches: the branches to Stourbridge and to Pensnett reservoir are 2 miles 1 furlong, and level; from the Wolverhampton canal to the reservoir on Pensnett-chace the distance is 6 miles 1 furlong, and the rise 191 feet 3 inches; from Stourbridge to the branch of the reservoir, one mile and a quarter, and level.

The proprietors of this canal are empowered to make such new cuts as may be necessary for the uses of the collieries, &c.

The great profits arising from this canal have caused several rival schemes to be agitated.

## THE EREWASH CANAL.

At the time when the navigable canals were making in the interior parts of the country, it was proposed by the gentlemen and owners of the extensive coal-mines in the neighbourhood of Heanor, Langley, in Derbyshire, Eastwood, Awsworth, Cossall, Ilkeston, &c. to carry their coals to the Trent, which, for want of a water carriage, lay useless both to the owners and to the public. Accordingly a survey was made, a plan drawn, and an estimate of the expense produced, in 1776; but it was not till 1777 that an act was obtained to execute it.

This canal is nearly parallel with the river Erewash, and passes by all the above coal-works or mines, and is carried over Nutt-brook, by an aqueduct, to Stapleford and Sandy-acre, and across the main road from Nottingham to Derby, and by Long Eaton into the Trent, not far from Sawley-ferry; after a course of  $11\frac{1}{4}$  miles, with a fall of 180 feet 8 inches.

## CHESTERFIELD CANAL.

The late Mr. Brindley, in the year 1769, projected this canal, surveyed the ground, and delivered in an estimate requisite for its completion, which he stated at 100,000*l*. The plan met with general approbation, and an act of parliament was obtained for carrying it into execution in the spring of 1770; and notwithstanding the act prohibited the proprietors from beginning the work till the whole sum of 100,000*l*. was subscribed, this canal was conceived to be of such consequence by the gentlemen, landowners, and owners of coal-works, that that sum was subscribed as soon as the contents of the act

were known. The work was therefore immediately begun, and carried on under the direction of Mr. Brindley till his death, and since that time continued and completed by Mr. Henshall. In the course of this canal, the engineer has had numerous difficulties to encounter; the principal of which were at Hartshill, where the canal is carried under ground near 3000 yards.

This canal is of inestimable advantage to the neighbouring country, in conveying coals, lead, stone, lime, and other heavy articles; which are now carried at one-fifth part of the usual price of land-carriage, and with equal expedition. It has always produced to the subscribers a profit exceeding their most sanguine expectation.

The course of this canal begins at Chesterfield, and proceeds by Rickett's-mill, near Staveley-forge, by Staveley-town and coal-works, the Hague, and near Eckington and Killmarsh, to the beginning of the tunnel at Hartshill; and at the length of 3000 yards comes out again near Peck's-mill, and proceeds then by Shire Oaks to Worksop, across the Royton river at Kilton. It thence takes a circuit to near Bilby-hall, and round again to Babworth, and almost all round the town of Retford; then turns from the south-west to due north, and passes by Welham, Clareborough, Clawarth, and round Crindley on the Hill, to Misterton, into the Trent, near Stockwith; after traversing a course of  $44\frac{1}{4}$  miles, with a rise of 45 feet from Chesterfield to Norwood, and a fall of 335 feet from Norwood to the river Trent.

## BUDE CANAL TO LAUNCESTON.

The act nominates 80 trustees for completing the canal, by the following course : From the port Bude, Cornwall, through the several parishes of Marham Church, Poundstoke, Flyke, St. Mary Whitestone, Launcells, Bridgerule, North Tamerton, Boyton, Werrington, North Pitherwin, Tremain, Egleskerry, St. Thomas, St. Mary Magdalen, South Petherwin, Tremaine, Laneast, Alternon Lewanick, North Hill, Linkinghorn, Stocke Climsland, and Calstoke, in Cornwall and Devon, to the river Tamer.

The powers of the proprietors are next ascertained, which are similar to those granted by other acts of the same kind. A particular clause states, that the cut or canal be carried under ground, and arched over for a space of 300 feet, near to the mansion-house of Whiteford, in the parish of Stocke Climsland. The land to be used for the canal not to exceed 63 feet in width, towing-paths included, except for making a dock or basin; nor to be of a greater depth than 39 inches; and in such places where it shall be judged necessary for boats and other vessels to turn, lie in, or pass each other, or where any engine or crane may be erected, not above 20 poles in breadth.

The estimate for completing this canal was 40,000*l.* with liberty to borrow 20,000*l.* more, if necessary.

This canal, I believe, is not finished, nor likely to be; because the chief commodity of traffic would be coals from Wales; on which account, though coals are very much wanted on the whole length of the canal, the subscribers are afraid of undertaking it.

## CANAL FROM MARKET WRIGHTON TO THE HUMBER.

*In the East Riding of Yorkshire.*

The preamble of the bill is as follows : Whereas certain commons, low grounds and cars, within or near the villages, townships, or parishes of Market Weighton, Blacktoft, Everingham, Harsewell, Seaton, Ross, Holme upon Spalding-moor, Froggathrope, Gribthrope, Spaldington, Bursæ, Hasholm, Wholsea, North Cliffe, South Cliffe, Hotham Houghton, Bromfleet, Faxfleet, Shipton, Sancton, and also a certain common called Walling Fenn, containing 20,000 acres, are subject to be overflowed, and unprofitable to the proprietors ; and whereas the draining of the said commons, low grounds, cars, and fens, and the making the main principal drain navigable from the river Humber, at or near a place called Fosdyke Clough, situate on the banks of the said river, will be of great utility to the public ; but the same cannot be effected without the aid of parliament : May it therefore please your Majesty, &c.

To give an abstract of the act would be superfluous, as the preamble comprehends its nature and utility.

The tolls to be taken not to exceed 4s. for every ton of grocery goods, wares and merchandises ; 2s. for every chaldron of coals ; 1s. 6d. for every chaldron of lime ; 1s. for every ton of stone ; 6d. for every ton of manure of all sorts ; 2s. for every 1000 of tiles ; 1s. for every 1000 of bricks ; and 8d. for every pack of wool, containing 16 stone to each pack ; to be paid in proportion of the distance ; the whole being payable from the Humber to Market

Waighton. No tolls to be paid by boats for pleasure, or vessels laden with materials for the purpose of drainage or navigation.

This canal is finished, and turns out greatly to the advantage of the land-owners and proprietors, not only in draining the lands, but by facilitating the carriage of the produce and manufactures of a large extent of country, which before were carried at a very great expense by land-carriage.

#### SIR NIGEL GRESLEY'S CANAL.

In the year 1775, an act was granted to enable Sir Nigel Gresley, bart. and Nigel Bowyer Gresley, esq. his son, to make and maintain a navigable cut or canal from certain coal-mines in Apedale to Newcastle-under-Line, in the county of Stafford.

The preamble of the bill is as follows : Whereas Sir Nigel Gresley, bart. and Nigel Bowyer Gresley, esq. son and heir-apparent of the said Sir Nigel Gresley, are proprietors of several considerable coal-mines, and veins of coal, within the manor of Apedale, in Staffordshire : and whereas the making a navigable cut or canal from the said coal-mines to Newcastle-under-Line, in the said county, will be of particular advantage to the inhabitants of the said town, and parts adjacent, and of public utility : and whereas the said Sir Nigel Gresley and his son are the proprietors of a considerable part of the land through which the said cut or canal is proposed to be made, and are willing and desirous, at their own expense, to make and maintain such cut or canal : May it therefore please, &c.

Then follow the usual clauses of all navigation acts. The width of the canal, towing-paths, fences,

the ditches, and drains, not to exceed 26 yards, except in such places where the said cut or canal shall be raised higher, or cut more than ——— feet deeper than the surface of the land; and in such places where vessels lie, or pass each other, or where any crane may be erected, not to exceed 60 yards. The proprietors also engage to deliver coals from their coal-mines as aforesaid, at the town of Newcastle-under-Line, to the inhabitants thereof, at the price of 5*s.* per ton of 20 cwt. of 120 lbs. per cwt. for a term of 21 years; and for 5*s.* 6*d.* per ton for the ensuing further term of 21 years, and so in proportion for any greater or less quantity than a ton. And they also oblige themselves to keep a stock at their wharf at or near the town of Newcastle, for the consumption of the town, under a penalty of 40*l.* and the inhabitants wanting a less quantity than a ton, they are to be delivered to them at 3½*d.* per cwt. A clause is also inserted, that the commissioners, on proof of great expenses, &c. may raise the price of coals, the second term of 21 years, to 6*s.* per ton.

#### EARL OF THANET'S CANAL.

In the year 1773 an act passed to enable the right honourable Sackville earl of Thanet to make a navigable cut or canal from a place called the Spring, lying near Skipton Castle, Yorkshire, to join and communicate with the navigable canal from Leeds to Liverpool, in the close called Hebble End Close, in the township of Skipton, Yorkshire.

The preamble sets forth: That whereas the owners and occupiers of land, and others the inhabitants at or near Leeds, Bradford, Bingley, Keighly, Sillsden,

and other places lying contiguous to the said canal, have occasion for, and frequently are in great want of lime and lime-stones to improve their lands, and for other purposes; and the right honourable earl of Thanet is possessed of grounds near Skipton Castle aforesaid, in which are great quantities of lime-stone rocks, within 500 yards from that part of the intended canal which lies nearest to the town of Skipton; and whereas it is very practicable to make a canal for the navigation of boats and other vessels from the aforesaid spring which joins the lime-stone rocks, through the lands, grounds and wastes of the said earl, and other land belonging to the free grammar-school at Skipton aforesaid, to join and communicate with the navigable canal from Leeds to Liverpool at a place called Hebble End Close, in the township of Skipton; and whereas to accommodate the aforesaid towns, and inhabitants, as also the adjacent country, with lime and lime-stone, the said earl is desirous of cutting a canal at his own expense, and to keep and maintain the same, together with the roads and towing-paths; but the same cannot be effected without the aid of parliament; be it enacted, &c.

The act is short; the canal going entirely through his lordship's grounds, except Hebble's-close-field, which belonged to the free grammar-school at Skipton. Arbitrators were appointed for the purchase; and the act provides, as usual, for the making of bridges, towing-paths, aqueducts, tunnels, &c. &c. &c.



## HEREFORD AND GLOUCESTER CANAL.

In 1791 an act of parliament was obtained for making the above canal, which has the following course.—Beginning at Hereford, it goes northerly, and crosses the river Lugg, below Sutton St. Michael, and Sutton St. Nicholas; whence it pursues an easterly course, by West-Hide, Cannon-Froome, Munsley; crosses the river Leadon below Bosbury, and pursues a southerly course, by Ledbury, Dinnington, to Dimmock; about two miles below Ledbury it again crosses the river Leadon: from Dimmock it goes easterly for about four miles, and twice crosses the river Leadon, and passes by Pauntley Upleadon, Newent, Rudford, and Lassington; crosses again the river Leadon, and a branch of the Severn; thence across Alney Island, and into the Severn, opposite Gloucester. The length and lockage are as follow:—From Widemarsh, near Hereford, to Withington-marsh, is six miles, and level. From thence to the beginning of the summit, near Monkhide, is three miles, and 30 feet rise. The summit continues  $8\frac{1}{2}$  miles, to Ledbury, and is level. From thence to Gloucester 18 miles, and falls 195 feet 7 inches.—The total length is 35 miles 5 furlongs, with 225 feet 8 inches lockage. The collateral cut to Newent is three miles, and ten feet fall to the junction. At the beginning of this canal, near Hereford, is a tunnel of 440 yards; and another about the middle of the summit, 1,320 yards long. The width of the canal, towing-paths, &c. is 14 yards, with a power of using all springs, &c. within 3,000 yards, with some exceptions. The expense is estimated at 25,000 *l.* with liberty to raise 30,000 *l.* more, if wanting.

By this canal a communication will be opened for the collieries in the neighbourhood of Newent, and other tracts of land possessing large mines of coal, and with several lime-stone quarries; and not only the vicinity of Hereford, but the interior of that part of South Wales, will be much benefited, as thereby a continued water-carriage may be effected to the several ports of London, Bristol, Liverpool, and Hull.

#### KINGTON AND LEOMINSTER CANAL.

The act for this canal was obtained in 1791, and has the following route.—Beginning at Kington, it passes by Stanton, Kingsland, where it crosses the river Lugg, and makes a bend to Leominster; whence it turns between Eye and Berrington, by Orleton, Brimfield, where it crosses the river Teme, by Little Hereford, Burford, Tenbury, Rochford, Knighton; there crosses the river Rea, and goes on to Lindridge, Low, Pensax, through a tunnel to Jones's Hole, and by Arley, there falling into the Severn, just above Stourport.

From Kington to near Stanton Park, four miles, and level. From thence to Milton,  $2\frac{1}{2}$  miles, and a fall of 152 feet. From thence to near Kingsland is  $3\frac{1}{2}$  miles, and 37 feet fall. From thence to Leominster is  $4\frac{1}{2}$  miles; and 64 feet fall. From Leominster, at  $1\frac{1}{2}$  mile, is a rise of 18 feet. From thence to Wiston is  $5\frac{1}{4}$  miles, and level. From thence to Letwich Brook,  $4\frac{1}{2}$  miles, and 36 feet fall. From thence to the river Rea is seven miles, and level. Thence to the tunnel at Sousnant is one mile, and rise 30 feet. From thence it is level nine miles through the long tunnel at Pensax; from thence to the junction

with the Severn, being a little more than three miles, is a fall of 207 feet. The total length is something more than 45 miles; and the total lockage is 544 feet, viz. 496 feet fall, and 48 feet rise. On this canal are two tunnels; that at Sousnant, of 1,250 yards; the other at Pensax, 3,850 yards. Near Tenbury are two collateral cuts for the accommodation of certain mills in the neighbourhood.

The ground allowed for the canal, towing-path, &c. is 26 yards, with power to use springs, &c. within 2,000 yards—certain waters excepted. The money to be raised is 150,000 *l.* and liberty to raise 40,000 *l.* more if wanted.

The rates of tonnage are long, but useless to the generality of readers.

The advantages expected from the line of this canal are, an easy conveyance of coal, lime, and iron ore, those necessary articles to husbandry and manufactures, for which the demand will be increased by the cheapness of carriage; whereby the working of the old quarries will be encouraged, and new ones opened; being an easy conveyance by water to the ports of London, Liverpool, Bristol, and Hull, including an immense tract of manufacturing country.

It is proposed to introduce on this canal some inclined planes for the use of the navigation, which I hope will answer the purposes proposed, as they possess many advantages in situations where water is scarce, and their construction is less expensive than locks. The first idea of which, I presume, was taken from my description of them in the Chinese method explained in my 4to edit. of the History of Inland Navigation; published 1791.

**WORCESTER AND BIRMINGHAM CANAL.**

This canal begins at Birmingham; from whence it takes a course through the parishes of Edgbaston, Northfield, King's-norton, Alvechurch, Tardebig, Stoke-prior, Dodderhill, Hanbury, Hadsor, Himbleton, Oddingley, Tibberton, Hinlip, Warndon, Clains, St. Martin's, and, at Diglis, adjoining the south side of Worcester, falls into the Severn.

The length of this line is  $31\frac{1}{4}$  miles, of which the first 16 miles from Birmingham are upon a level; the remaining  $15\frac{1}{4}$  miles, have a fall of 448 feet. The water for this canal is to be raised from the river Severn by fire-engines, together with such springs as may arise in making the canal. The Worcester company are restrained from making a junction with the Birmingham and Fazeley canal; but the proprietors of that canal are not restrained from making the junction. This proceeds from the apprehension of the Birmingham canal losing water. Indeed the Worcester company appear very much distressed for water; and they are restricted from using nearly all the brooks which lay in the line.

The width of the canal, towing-paths, &c. is 30 yards. The company are allowed to raise 180,000 *l.* and 70,000 *l.* more if necessary.

Compensation is to be made by the Worcester company to the Droitwich canal company, if their profits do not amount to five per cent. on each share; and to the Stourbridge canal company, if their profits do not amount to 9 *l.* per cent. on each share. Also to the Dudley extension canal, if their profits are decreased. Also, an annual compensation to the water-bailiff of Worcester, in lieu of his dues upon coals.

The completion of this canal shortens the communication for the manufactories of Birmingham with all the trading towns on the Bristol channel; and, in return, will afford to the goods of those towns a certain conveyance to London, Liverpool, Hull, &c. The Wednesbury coal also will have an easy carriage, as well along the whole line of the canal, as to many cities and towns which are below Worcester on the banks of the Severn.

Nov. 1802.—*Remarks on the progress of Canals.*

The Worcester and Birmingham canal shares of 140 *l.* had fallen to nothing; a plan for the completion is in agitation; the shares have risen to 40 *l.*

#### MANCHESTER CANAL TO BOLTON AND BURY.

This canal commences on the north side of Manchester, and joins the river Irwell, with which it runs nearly parallel in its northerly course, and crosses it above Clifton Hall, running by its side up to Bolton, in its way crossing the river Roach, where also the branch goes to Bury, making the total length 15 miles 1 furlong, with 187 feet rise.

The ground allowed for the canal, towing-path, &c. is 26 yards; no water to be taken from the rivers Irwell and Lever. The money allowed to be raised is 47,000 *l.* and 20,000 *l.* more by mortgage or shares, if wanted.

This canal will open a cheap and easy communication, not only to the before-mentioned towns, but will also be highly convenient for the intermediate country, which abounds with mines of coal, and other minerals, in great request at Manchester, its connections and dependencies.

## LEICESTER NAVIGABLE CANAL.

This canal begins at, and connects at the bason of the Loughborough canal; passes on the north side of the town, and falls into the river Soar, at the village of Quarndon. Thus far is a new cut; the remainder is only improving the rivers with occasional cuts and deviations. From this union the river Soar is to be made and kept navigable for boats, barges, &c. to its junction with the river Wreak; which river is also to be made navigable to Turnwater-meadow, in the parish of Cossington: through this meadow, and the parishes of Syston, Barkly, and Thurmaston, there is a cut made to avoid some shallows which again falls into the Soar, which also is to be made navigable to West-bridge, in the town of Leicester.

The rail-ways, &c. are as follow:—From Thringston-bridge to Forest-lane, there is a water level, through the parishes of Osgathorp, Gracedieu, Belton, Sheepshead, and Beaumanour; which level is also continued, by a rail-way, to the bason of the Loughborough canal. There are rail-ways to the water level, from Messrs. Raper and Fenton's coal-works, and from Mr. Boulton's and Mr. Burslem's coal-works. From Thringston-bridge another water level is made to the lime-works at Barrowhill and Cloudhill, with rail-ways. Power is also given to the company to make other rail-ways connecting with the water levels, not exceeding 2,000 yards long. The reservoir for the water levels is to be upon Charnwood-forest, between Goat-house and Blackbrook-bridge.

From Thringston-bridge to the Loughborough canal is  $7\frac{1}{4}$  miles, with 185 feet fall. From the Loughborough canal to the junction with the river Soar is more than 3 miles, and level. From this junction to Leicester is 11 miles, with 45 feet rise.

This canal crosses the Loughborough canal within 300 yards of its termination; for which, and other reasons, the Leicester company guarantee to the Loughborough company 3000*l.* per annum; for which guarantee, &c. they agree not to take more than 1*s.* 6*d.* nor less than 10*d.* per ton, for coal navigated from the Trent to Loughborough.

The breadth allowed for the canal, towing-paths, &c. is 20 yards. The company may raise 46,000*l.* and, if more be wanted, 20,000*l.* more.

The powers of this act, obtained in 1791, have been long wished for. Perseverance has at last obtained the object, which will open a cheap and easy conveyance for the produce of the mines, which are so plentiful about Thringston-bridge; which will not only greatly improve the estates, but also accommodate, at a cheap rate, a large extent of country with coal, lime, &c. passing one way into the Trent with all its extents, the other way to Leicester and Melton Mowbray; from which latter place new schemes are in agitation, of great extent, and usefulness.

#### LEICESTER CANAL TO MELTON MOWBRAY.

This act was obtained in 1791, and enables the proprietors to make the rivers Wreak and Eye navigable, from the junction at Turnwater Meadow to Melton Mowbray, by new cuts and deviations where necessary; and to cleanse, deepen, enlarge, alter, straighten, &c.; to make new trenches or passages

for water, in or upon the grounds adjoining. The breadth of new cuts and towing-paths not to exceed 20 yards; and the towing-path on the side of the rivers 3 yards, or 6 in crooked places. They are allowed to raise 25,000*l.* and liberty to raise 5000*l.* more if wanted.

The above mentioned navigation is but a continuation of the Leicester canal; the result of benefits must be nearly the same.

#### ARUNDEL CANAL.

This act, obtained in 1791, empowers the Right Hon. Earl of Egremont, his heirs, &c. to make and maintain the river Rother navigable for boats, barges, &c. from a piece of ground called the Lower Platt, near Midhurst, Sussex, through the several parishes of Woollavington, Easebourn, Ambersham, Selham, Lodsworth, Tillington, Burton, Duncton, Petworth, Sutton, Coates, Egdean, Fittleworth, Bury, Coldwaltham, and Stopham, to a certain piece of land called Stopham Meadow, and from hence to make a navigable canal to the river Arun near Stopham-bridge; and also to make another navigable cut from the river Rother, near Stopham-bridge, to Haslingbourn-bridge, in the parish of Petworth, Power as usual is given to cleanse, scour, deepen, enlarge, &c. and to make towing-paths, &c.

Every exertion to render the inland navigation of this country more complete, deserves much praise; and there can be no doubt but the patriotic undertaker of this canal will not only benefit his own lands and estates, but receive the thanks of the neighbouring country, for so noble an exertion for their accommodation.



## LEWIS CANAL.

Before this act passed, which was in 1791, the river Ouse between Newhaven-bridge and Lewis was navigable only for small barges at particular times of tides; but, by widening, deepening, and some new cuts, it will make the river constantly navigable for boats of larger burthen. It is intended so to deepen the river as at ordinary neap tides to admit vessels drawing four feet water, up to Lewis-bridge; whereby, of course, the trade and commerce on the same will be much accommodated and increased. For this purpose the trustees have extensive powers to cleanse, deepen, scour, widen, straighten, &c. the said river, and to make new cuts, and for this purpose may use any land within 2000 yards of the river; may take soil, gravel, &c. for the purpose of embanking; and may throw or cast soil, &c. on the adjoining grounds.

A great use also intended, is to drain certain lands lying to the east of Lewis, called Laughton Levels; which will be done by embanking and straightening the river up to Lewis-bridge, and at certain places higher up the river.

And, for the purposes of this act, the trustees are empowered to borrow money on the security of tolls and taxes. A statement of which is deemed useless.

By this act a vast quantity of land will be greatly benefited by drainage: as the embankments are to be continued on the east side of the river, above Lewis-bridge, to a place called Bushy Brook; and on the west side, above Lewis-bridge to the upper end of the new cut; and on the north side of Glynd Sewer, from Sound to the Swall Bank;

and on the south side, from Sound to a piece of land called the Cockfield, &c. &c. which lands are divided into five divisions, and are liable to certain rates which are under the direction of the commissioners of sewers. The lands below Newhaven-bridge are exempted from rates, and are to maintain their own walls, &c.

#### MONMOUTHSHIRE CANAL, 1792.

This canal commences on the west side of the town of Newport, having a basin connected with the river Usk ; it passes between the town and the river, and crosses the Chepstow road : from thence, by Malpas, it pursues its route parallel to, and near the river Avon, by Ponty Pool to Pontnewydd, being near 11 miles, with a rise of 12 feet in the first mile ; the remaining 10 miles have a rise of 435 feet : from nearly opposite Malpas a branch or canal takes its course parallel to the river Ebwy to near Crumlin-bridge, being a course of near 11 miles from the junction, with a rise of 358 feet.—Making the total length of the two canals 22 miles 2 chains, with 805 feet lockage.

From Pontnewydd there is a rail-road alongside the river Avon to the furnaces at Blaen-Ason, being  $5\frac{1}{4}$  miles, with 610 feet rise ; and from Ponty Pool there is a rail-way to Tronsnant Furnace of one mile long, with a branch to the furnaces at Blaen-Dir of half a mile : from Crumlin bridge a rail-way is continued alongside the river Ebwy, a branch of which it crosses, after a continuance of three miles, with a rise of 139 feet. This road is continued alongside the Ebwy Fawr river, by Ebwy Vale Furnace, to the iron-works at Beaufort, being continued near 7

miles, with 480 feet rise : from near the extremity of this road there is a branch to Sorwy Furnace, of  $1\frac{1}{4}$  mile. There is also another rail-way along the river called Ebwy Frach to Nant-y-glo,  $6\frac{1}{4}$  miles, with a rise of 518 feet.

The act for this canal was obtained in 1792. The proprietors are called "The Company of Proprietors of the Monmouthshire Canal Navigation." The several places receiving accommodations from this canal are before mentioned ; it is needless to enlarge on the benefits they will receive, more than to say—The act authorises the proprietors to make new rail-ways to any iron-works, lime-stone quarries, or coal-mines, within 8 miles ; the same may be done by owners of iron-works, &c. if the company refuse.

The ground allowed for this canal, towing-path, ditches, &c. is 26 yards, and the company are empowered to raise 120,000*l.* to be divided into shares of 100*l.* each ; and liberty to raise 60,000*l.* more if wanted.

Five per cent. of the clear profits of this undertaking is to be invested in government securities, till the same amounts to 1000*l.* as a fund for repairs. When the profits shall enable the company to share 10 per cent. the commissioners are empowered to reduce the tolls ; and first on coals. If, in consequence of the reductions, 10 per cent. cannot be divided, the tolls may be advanced. Boats under 20 tons are not to pass locks without leave, or paying for that quantity.

Every advantage resulting from canals in general may be expected from this in particular ; no part of a country stood more in need of it, nor can any be more benefited. The bowels of the earth are here

loaded with minerals—hitherto unsought for, and little known, merely for want of such a conveyance to market. This is now obtained, old mines will be explored, new ones discovered, and mother Earth ransacked for her hidden treasures. Nor will the forests on her surface longer remain neglected; all will yield to the converting hand of industry. Possessions will be greatly increased in value, and the labourer will find lasting food for his perseverance on ores of iron and lead, stone and lime quarries, timber trees, &c. which, by so ready a conveyance to the Bristol channel, will spread not only over England, but the world.

It is proposed to use inclined planes on this canal, which, doubtless, from the abilities of the engineer (Mr. T. Dadfield, jun.) employed in their construction, will be made to answer well.

Nov. 1802.—*Remarks on the progress of Canals.*

The Monmouthshire canal does not yet rise as it was expected; the last dividend was 2*l.* 12*s.* 6*d.*

#### COOMBE HILL CANAL.

This canal takes its name from Coombe Hill, in the parish of Leigh, Gloucestershire, where it begins, and joins the Severn at Fletcher's Leap, in the parish of Deerhurst, passes through the commons of Leigh and Deerhurst, and is  $3\frac{1}{2}$  miles long, with a fall of 15 feet.

This canal is the sole property of only three private persons, who obtained the act in 1792, Thomas Burges, and William Miller, Esqrs. and Mrs. Sarah Mumford. It was undertaken for the purpose of affording a cheap and shortened carriage from the

Severn to Cheltenham;—the distance being, either from Gloucester or Tewksbury, 9 miles; whereas from Coombe Hill it is only four miles. There are also large collieries in the neighbourhood, which naturally must be greatly benefited by this canal.

#### MANCHESTER AND OLDHAM CANAL.

This canal was begun in 1792, and commences on the east side of Manchester, near a street called Piccadilly; crosses the main road to Ashton, and the river Medlock; passes Fairfield, and ends at Ashton-under-Lyne, Lancashire. At Fairfield a branch goes off to the New Mill near Oldham; and from this branch there is a cut to Park Colliery. The total length is 11 miles, with 152 feet rise.

The breadth allowed for the canal, towing-paths, &c. is 30 yards, and not to deviate more than 100 yards from the line laid down.—The proprietors are allowed to raise 60,000*l.* and, if not sufficient, 30,000*l.* more.

This canal and branches will supply the town of Manchester with coals and cannel (which are essential to the manufactures of Manchester), and also with stone; and will supply the country through which it passes, with lime and manure for the improvements of land.

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The Ashton canal, a discount of 20*l.*

#### WYRLEY AND ESSINGTON CANAL.

This canal was begun in 1792, and commences at a place called Wyrley Bank, Staffordshire; passes through the Old Field, over Essington Wood and the Snead Commons, across the road from Wednes-

field to Bloxwich ; from the south side of Bloxwich, in a direct line to Birchill. From Snead Common the canal goes through Lane Head, near Perry Hall ; from thence to Lapley Hayes, near the Moat House, to Wednesfield, by the Heath, and there joins the Birmingham canal. The branches are—one from near Wolverhampton to Stow Heath, another from the canal at Pool Hayes into Ashmore Park, with another from Lapley Hayes into another part of Ashmore Park.

The length of this canal is near 9 miles ; but I have no account of the lockage. The width of ground allowed for the canal, towing-path, &c. is 26 yards. The proprietors are allowed to raise 25,000*l.* and, 20,000*l.* more, if wanted.

The intent of this canal is to convey the produce of the mines in its neighbourhood, at a cheap rate, to the several manufactories using the same.

#### HORNCASTLE AND LINCOLN NAVIGATION.

This act passed also in 1792, authorising the proprietors to purchase Messrs. Dyson and Gibson's interest in the Tattershall canal ; to deepen, widen, and enlarge the same ; and extend it to the river Bain, within the parish of Tattershall : also, to make the river Bain, and the streams communicating therewith near the town of Horncastle, navigable to Horncastle, Lincolnshire, from the junction of the canal ; and to make any new cuts on the sides of the river, to straighten its course, and to avoid mills or other obstructions. The breadth of the river, or cuts, towing-paths, drains, fences, is not to exceed 20 yards.

As it is expected the trade of this navigation will cause a great increase of tonnage on the Witham river, goods which pass to or from the Horncastle navigation, on the Witham river, are to pay but half the accustomed dues to the Witham company.

The proprietors are empowered to raise 15,000 *l.* to be divided into shares of 50 *l.* each, with liberty to raise 10,000 *l.* more if the first sum is insufficient.

When the profits from the tolls arise to a dividend of more than 8 per cent. the tolls are to be lowered, reserving a capital of 1000 *l.* for contingencies.

To make this navigable communication complete at all times, the act empowers the commissioners of the river Witham to make that river completely navigable through the High Bridge in the city of Lincoln, into the Fosdike canal.

The expenses of this improvement are to be borne and defrayed, for 7 years jointly, by the Witham company, and the two companies of the Sleaford and Horncastle navigation.

The completion of the purposes of this act will afford a desirable navigation and conveyance for goods to the Trent, greatly advantageous to the county of Lincoln.

#### SLEAFORD NAVIGATION.

This act, obtained in 1792, authorises the proprietors to complete a navigation, and keep the same passable for reels, boats, &c. from the river Witham, near Chapel-hill, along the course of the river Kyme Eau, and Sleaford mill-stream, to New Sleaford, and Old Sleaford, Lincolnshire, through the south bridge in Sleaford, and along the south branch of the mill-stream, to the castle causeway. For this

purpose they are to deepen, widen, contract, &c. to make new cuts where wanting, so as to have the water 18 feet wide at the bottom, 30 feet wide at the top, and four feet deep up to Haverholm-mill, and from thence to the castle causeway to be five feet deep; and they are allowed to have water from the fen lying above the head of the navigation in New Sleaford.

The locks on the navigation are to be 60 feet long, and 15 feet wide in the clear. The tolls on the river Witham are to be reduced one half to goods passing on this navigation—and the same to the Horncastle company. The Witham tolls are to be equal, passing either to Lincoln, or to Boston. The company are authorised to raise 13,000 *l.* to be divided into shares of 100 *l.* each; and may raise 10,000 *l.* more, if wanted.

The profits or dividends arising from this navigation, are limited to eight per cent.; and when they exceed that sum, after reserving a fund of 1,000 *l.* for contingencies, the tolls are to be reduced.

This year, 1792, an act was obtained for improving the navigation of the river Medway from Maidstone to Aylesford-bridge; but as this was for improving an old navigation, and also a river one, I forbear giving the particulars.

#### STOVER CANAL.

The length of this navigation, from the tide-way of the river Teign, near Newton Abbots, is to Newton Bushel one mile, and to Bovey Tracey  $5\frac{1}{4}$  miles, with 50 feet rise. To Chudleigh, the same distance, and a rise of 20 feet; and in its course communicates



with a valuable coal-mine, and several excellent clay-pits. It commences at the navigable part of the river Teign, six miles from the port of Teignmouth, Devonshire, and terminates at the great road leading from Chudleigh to Ashburton, near which town, and some others in that vicinity, it is to be continued ; by which means Morton and other parts will be supplied with manure at an easy rate, particularly lime and sea sand.

As this canal ends within a few miles of the forest of Dartmore, extending the canal to that uncultivated tract may be well worthy notice ; and if it should be thought advisable to be carried into execution, the whole of that uncultivated district may be easily supplied with manure and all the necessities to a cultivated country ; returning as back-carriage, stone, minerals, grain, &c. to be shipped at Teignmouth for distant markets.

The importance of this canal is inferior to none. By it the various potteries of Staffordshire, and the whole kingdom, will be supplied with the most valuable clay for their manufactories, the demands for which are daily augmenting since the spirited exertions of the proprietor of the canal has so much reduced the distance and rate of carriage ; heretofore, not half the quantity wanted by the potteries could be obtained. By return of the clay ships, the whole country is well supplied with coals.

This canal has been executed under the direction of Mr. Gray, of Exeter, in 1792. The great advantage of obtaining manure at a cheap rate, has been so amply experienced by the neighbouring landowners, that the proprietor has experienced the most satisfactory testimonies of having imparted a lasting

benefit to his neighbours, who have all been forward to accommodate this undertaking; particularly Lord Courtney, who, with a liberality worthy his rank, has granted permission for the canal to go through some extensive grounds belonging to his lordship.

The whole of this canal, and nearly all the ground through which it passes, belongs to James Templer, esq. of Stover Lodge, Devon; has been executed at his entire charge; and is an example of what may be done by an individual, who deems the prosperity of his neighbour, the advancement of commerce, and the good of his country—objects worthy his study and attention.

#### SANKEY CANAL.

This canal leads from the coal-pits at St. Hellen's, near Prescot, to connect with Liverpool by the river Mersey, and was cut to convey coal to the latter place. Near this canal are the large copper-works of the Anglesea Company, and also the Lancashire plate-glass-works. The length of the canal is 12 miles, with a fall of 90 feet. The act for making this canal was obtained in 1755, and from its date must be allowed precedence to the noble undertaking of the Duke of Bridgewater in this line; it empowers the proprietors to render the brook called Sankey Brook navigable; but the advantages of a dead-water navigation was then understood so well as to induce the proprietors to make an entire new cut by the side of the brook, and used it only for supplying the canal with water. This canal was cut under the direction of Mr. John Eyes, surveyor, Liverpool.

## LOUGHBOROUGH CANAL.

This canal begins with the junction of the rivers Soar and Trent. The act was obtained in 1776, and empowers the company to make the river Soar navigable to Bishop's Meadow, in the liberty of Garenton, and from thence to cut a canal to the Rushes at Loughborough, Leicestershire.

This canal commences at the river Soar, a little below Gracedieu Brook, and takes a straight course to the Rushes at Loughborough; it is about one mile long, and level. This navigation, although so short, has been found very beneficial to the inhabitants of Loughborough, as it brings a regular supply of coal at a cheap rate, and, by means of the river Soar, it enjoys a regular connection with the Trent, and by that river with all the various and important canals in the interior of the kingdom; and by the late improved navigations to Leicester, Melton Mowbray, &c.

## CROMFORD CANAL TO LANGLEY BRIDGE.

This canal begins at Cromford, runs a great way parallel with the river Derwent, and passes Critch Frithley, Tod Moor, Heage, Hartey, Lescoc, Heynor, and joins the Erwash canal at Langley-bridge, Derbyshire, which canal falls into the Trent near Nottingham.

The total length from Cromford to the junction is 14 miles, of which the first 11 are level, and the other three miles have a fall of 80 feet. There is a collateral cut to some coal-works, of three miles, and level; besides several small tunnels, there is one on this canal of 3,000 yards long. Coal-mines abound in the neighbourhood of this canal, and are of great service to it.

**DONNINGTON-WOOD CANAL.**

This canal, the private property of the Marquis of Stafford, and John and Thomas Gilberts, esquires, was cut in 1778 ; it is six miles in length, and level. It begins at Donnington-wood iron-works, in the parish of Lillishall, and proceeds to Paved Line near Newport, all in the county of Shropshire : its use is principally for conveying iron-stone, lime-stone, and other raw materials, to the iron-works at Donnington-wood.

The boats are of 25 tons burthen.

**KETLEY CANAL.**

This canal was cut 1789, and is the private property of Messrs. W. Reynolds and Co. It commences at the Shropshire canal, at a place called Oaken Gates, and proceeds to Ketley iron-works, of which the above gentlemen are owners. The length of the canal is  $1\frac{1}{4}$  mile, with a fall of 67 feet to Ketley ; which is managed by a small lock of one foot lift, and an inclined plane 66 feet perpendicular height. It is proper here to say, this machine is the first constructed for use in England, and answers the intended expectations well, the loaded boats drawing up the empty ones. Much merit is certainly due to the person who first, by experience, shewed both the practicability and the eligibility of an unusual machine ; it is but justice to record the introduction of so useful a contrivance. To this canal there must have been seven or eight locks, which would have cost a great sum of money ; and water for their supply perhaps more, for at this time water is so valuable, that what necessarily passes into the lower canal as boats are let down, is reserved in a

well, and thrown back again by a small fire-engine : indeed the construction of this short canal shews certain marks of a superior genius.

The principal use of this canal is to convey coal, iron-stone, and raw materials, to the Ketley iron-works.—The boats carry about eight tons.

#### SHROPSHIRE CANAL.

The act for this canal was granted in 1788. It has the following course : Beginning at the Donnington-wood canal, in the parish of Lillishall, by Rockwardine Wood, Oaken Gates, Hollingswood, Stirchley, Madeley, the Hay, and into the Severn at Sheep-wash Meadow, two miles below Coalbrooke Dale. Its length is  $7\frac{1}{2}$  miles ; and the fall and rise is 457 feet ; the whole of which is managed by three inclined planes :—the first, at Donnington-wood, is a perpendicular ascent of 122 feet ; the length of the acclivity is 320 yards :—the second, at Stirchley, is a perpendicular descent of 126 feet ; the length of the declivity is 586 yards :—the third, at the Hay, is a perpendicular descent of 207 feet ; the length of the declivity is 300 yards. The machinery to the inclined planes is worked by a steam-engine. It has been said that the inclined plane on the Ketley canal was on a small scale, but those on this canal are sufficiently large to justify its general adoption as a very useful invention.

There is a collateral cut from this canal, at Southwell Bank, near Stirchley, which goes by Dawley and Lightmoore, to the head of Coalbrooke Dale. From the termination, the cargoes are lowered through perpendicular shafts or tunnels ten feet diameter, and 120 feet deep, to the rail-ways below,

which lead to Coalbrooke Dale iron-works, and the river Severn at Load Croft, and other wharfs in that neighbourhood: also, from the iron-works at Horse Hay, there is a rail-way which communicates with this canal.

This canal, with its connections, is very useful in conveying the raw materials to the many large furnaces in the vicinity, and for conveying their heavy manufactured articles to the wharfs and the Severn, whence they are dispersed to distant parts. The boats carry about 8 tons.

Nov. 1802. *Remarks on the Progress of Canals.*

The Shropshire canal ought to be more productive.

Experience has confirmed the great advantages arising from canals in a commercial country, which, with the increased state of the Manufactures and Trade of this country, have brought to maturity, within the space of two years only, Acts of Parliament for 36 new schemes for canals; which, with other bills for extending and amending rivers, &c. make 47 Acts in that period relative to the inland navigation of this country.

And it is worthy of observation, that the great sums of money engaged in this concern within the before mentioned period, is immense; amounting to the enormous sum of 5,200,000/.! And the more it is contemplated the better it appears; and what is most pleasing is, that the whole amount is expended in our own country, and among our own countrymen; and that chiefly among the laborious and industrious poor: many of whom must be constantly engaged in attending on these various

works, and their concerns. The prospect is still more flattering in another point of view, for from so large a capital expended in this country, great profits must arise to our merchants and artisans, and to the whole of those countries which these inland navigations pass.

Inland navigation is now proved to be a nursery to the navy ; this was pointed out in the introduction to this history. It cannot be thought this instance of the general benefit arising from canal navigation either trifling or unimportant, viewing the safety and prosperity of this most favoured island with the anxiety, affection, and zeal of a true Briton.

#### BARNSLEY CANAL.

In the 33 Geo. III. an act was obtained for this canal, which joins the river Calder below the town of Wakefield, Yorkshire, and passes Crofton, Felkirk, Royston, and thence to Barnsley, whence it makes a bend to Barnby Bridge, near the town of Cowthorn : it is 14 miles long. There are several railways to the canal from Barnsley, and also from Barnby Bridge. The fall from the junction with the Dearne and Dove canal, is 120 feet to the river Calder.

The proprietors have the necessary powers for making the canal, &c. The breadth of which with towing-path, &c. is 24 yards ; and not to deviate more than 100 yards from the line laid down, nor more than 20 yards in making the rail-ways. The soil, &c. dug in making the canal, to be levelled on the adjoining ground in a proper manner.

The proprietors are allowed to raise 72,000 *l.* to be

divided into 100 *l.* shares, and to raise 25,000*l.* more if necessary.

*Exemption from rates.* All dung, soil, marl, ashes of coal, and turf, and all other manure (except lime) for the improvement of adjoining lands. All materials for making or repairing any public or private roads (except flag-stones, curb-stones, or causeway-stones) under the usual restrictions.

In order to prevent any inconvenience to the inhabitants of Warmfield, from the smoke of the steam-engine, intended to be erected on Heath Common, for the purpose of supplying the canal with water; the said engine is to be so constructed that in working it will burn or consume its own smoke.

#### BASINGSTOKE CANAL.

The act passed this session, 33 Geo. III. enables the proprietors of this canal to raise either by loan, or by annuities, 60,000 *l.* in addition to the 126,000*l.* before raised, to finish the canal.

Nov. 1802. *Remarks on the Progress of Canals.*

The Basingstoke canal is improving, but until it forms a junction with some more profitable branch it is not likely to succeed to any parties but the public.

#### CAISTOR CANAL.

In this revision of 33 Geo. III. an act passed for this canal to join the river Ancholme, in the parish of South Kelsey; and in a direct line proceed to the town of Caistor, Lincolnshire, being about 9 miles.

The canal, towing-path, &c. is in breadth 22 yards. The company are empowered to raise 15,000*l.* to be divided into 100*l.* shares, and to raise 10,000*l.* more, if wanted.



*Exemption from Tolls.* Officers, or soldiers on their march, with their horses, arms, baggage, &c. timber, or stores for the use of his majesty. All gravel, sand, &c. for making or repairing public roads; also all kinds of manure for the adjoining lands; but not to pass any lock unless the water flows over it, nor vessels under 20 tons to pass any lock without leave, or paying for that tonnage.

The use of this canal is chiefly local, but shews that the public begin to know that water carriage is more advantageous than land carriage.

#### CHELMER AND BLACKWATER NAVIGATION.

The intent of this act, which was also obtained in the 33 Geo. III, is to make the river Chelmer navigable, by widening, deepening, &c. and making new cuts where necessary, as far as Beely Mill near Maldon, Essex, where by means of a cut the navigation leaves the river Chelmer, and crosses into the river Blackwater; down this river it proceeds about  $\frac{3}{4}$  of a mile to Hey-bridge, from whence another cut continues the navigation to Colliers-reach,  $1\frac{1}{2}$  mile below Maldon; there is a branch to Maldon, with a bason.

The length of this canal is 13 miles 5 furlongs, in which about 10 miles of the old channel is preserved; the rest is new cut. The fall from Chelmsford is  $79\frac{1}{2}$  feet.

The proprietors are empowered to purchase, dig, enter, &c. and the usual restrictions not to incommode the mills: nor to deviate more than 100 yards from the line laid down. The canal, towing-path, &c. is 40 yards. Besides, the proprietors may raise • 40,000*l.* at 100*l.* shares each, and further sum of 20,000*l.* more if necessary.

By this navigation the inhabitants of Chelmsford, and the neighbouring country, will be materially accommodated, by a cheap carriage for coal. And the farmers will be benefited by their corn being shipped for the London market at a trifling expense; for instead of their teams going 12 miles in very bad roads, they may now be employed at home. The exceptions from rates and tolls as usual.

An addition is wanted to this canal to carry it through the Rodings to Dunmow.

Nov. 1802. *Remarks on the Progress of Canals.*

The Chelmer canal shares, we believe, are not worth scarcely 5*l.* each.

#### DERBY CANAL.

The act for this canal was obtained 33 Geo. III. It begins at the Trent, and running through the village of Swarkstone, joins the Trent and Mersey, or Grand Trunk Canal, and at one furlong eastward, commences its course through Sinfin Moor, between Boulton and Osmaston, to the east side of Derby, where it crosses the river Derwent; from Derby, the cut to join the Erewash canal takes its course easterly, and passes Chaddesden, Spooden, Burrowash, Breaston, and joins the Erewash canal between Long Eaton and Sandiacre; from Derby to the North, there is a cut to Little Eaton, with rail-ways to Smalley mills, and Smithey houses.

The length of this canal from the Grand Trunk to Derby, is 5½ miles, with 12 feet rise. From Derby to the Erewash canal is 8¼ miles, with a fall 29 feet. From Derby to Little Eaton is 3¾ miles, with 17 feet rise. The length of the principal rail-

way to Smithey houses is  $4\frac{1}{2}$  miles, and to Smalley mills is  $1\frac{1}{2}$  miles. The whole length of the canal is 17 miles, and 58 feet lockage.

The company of proprietors have the usual powers of purchasing land, &c. and to make other rail-ways at future times. One to be made to Horsley Colliery, if Lord Chesterfield shall desire it; also owners of lands, mines, &c. may make rail-ways to join the canal. Restrictions and regulations are fully made for passage boats, and regulating the water from and to the Trent, the Grand Trunk, the mills on the river Derwent and this canal; and the locks are to be 90 feet long, and 15 feet wide in the clear.

The land for the canal, towing-path, &c. is 26 yards in breadth; and may be wider for docks, bason, deep cutting, or embanking; but not to deviate above 100 yards from the line laid down.

The company are authorised to raise 60,000*l.* divided into 100*l.* shares, and liberty to raise 30,000*l.* more, if wanted.

The Derby canal company are to permit 5000 tons of coals annually to go free of all rates, for the use of the poor of that town; and three members of the corporation, and the same number of proprietors to be chosen annually to distribute them.

*Exemption* of gravel, manure, &c. for lands, roads, &c. as usual.

The dividends of profit of this canal are not to exceed 8 per cent. the surplus to be applied to form a bank of 4000*l.* to answer all emergencies; which done, the rates to be lowered, so as not to divide more than 8 per cent.

A cut is to be made by the Derby Canal company at Weston Cliff, to join the Trent with the Grand

Trunk, if desired by the owners of the lime-works at Brudon, in Leicestershire ; provided a canal or railway shall be made from the lime-works to the Trent.

If the Derby canal cause a loss of the tolls on the Mansfield Road, under four per cent. the company oblige themselves to make the same good to the trust.

And as it is expected this canal will hurt the profits of the Derwent navigation, this company are authorized to buy the same, for 3,996 *l.* and to exercise similar rights, &c. as the former owners.

The advantages of this canal will be wonderfully beneficial to the town of Derby, where fuel is in great demand ; this article will be well supplied by the Cromford and Erewash canals, and some coal-pits near Derby ; where also is a plentiful supply of iron-stone, which must lie useless to the owners unless a cheap conveyance to a market can be had, which this canal will afford.

#### DEARNE AND DOVE CANAL.

The act for this canal was procured in 33 Geo. III. It begins from the cut which has been made to accommodate the river Dun navigation, between Swinton and Mexbrough, and goes by Wath, Wombwell, and Ardsley, to near Barnsley, in the West Riding of Yorkshire ; there to form a junction with the Barnsley canal, which joins the river Calder. There are two small branches, one parallel with Knolbeck Brook, to the iron-works at Cobcar Ing, the other along the head stream of the river Dove, to Worsbrough Bridge ; with a proposed extension of the branch near  $1\frac{1}{4}$  mile farther, to Rockcliffe Bridge,

adjoining the grounds of Earl Strafford, at Wentworth Castle.

The length of this canal from the union with the river Dun, to Barnsley, is  $9\frac{1}{4}$  miles, with 125 feet rise. The branch to Cobcar Ing is  $1\frac{1}{4}$  miles, and level. The branch to Worsbrough Bridge is one mile five furlongs in length.

The proprietors have the usual powers for making canals : and are not to deviate more than 100 yards from the line : there are also particular restrictions for preserving water in rivers and brooks, by gauge weirs, tumbling bays, &c. for the security of mills, &c. The two wells in the town of Barnsley are not to be injured. No water to be taken from the Cobcar Ing branch, to injure Earl Fitzwilliam's estate or grounds ; nor to the injury of Earl Strafford.

The breadth allowed is 27 yards. Owners of mines may make rail-ways to join the canal, but not at above 1,000 yards distance from the canal, except at Wath, where 2,000 yards are permitted. Other collateral cuts may be made to mines, either by the company or land-owners.

The company are allowed to raise 60,000 *l.* divided into 100 *l.* shares ; and may raise 30,000 *l.* more if wanted. A deed or certificate for each share is to be given, under the common seal of the company, which shall entitle, &c. the possessor.

*Exemption* as usual, gravel, dung, and all manures for the improvement of adjoining lands ; as also for coals and turf, but to pass no lock unless the water flows over.

The union of this with the Barnsley canal, at Barnsley, is to be level. At or within 150 yards of

the junction, shall be erected at the companies joint expense, a stop lock, with gates, &c. to prevent either canal from suffering by want of water in the other canal; the water at no time is to be lower than four feet six inches, on either of the sills of the lock; but if it ever should be so, the keeper of the other canal may stop the passage, till it shall be of that height. And, to preserve at all times the navigation, between Barnby Bridge and the Dearne and Dove canal, a stop-gate shall be erected, and constantly kept in repair at their joint expense; so as to prevent loss of water from the head level. All the locks on this canal are to be of a size to admit boats, &c. such as those commonly used on the river Dun. The company are obliged to keep four feet six inches water upon the sills of the locks on the whole line of the canal constantly; and no boats less than 30 tons to pass the locks, or to pay that tonnage.

This canal in union with the Barnsley canal will be of immense importance to the trade of the West Riding of Yorkshire; by a short trip of 20 miles, the Calder and Dun navigations are joined, and many mines of coal, iron, &c. on the line will be accommodated with a cheap and certain carriage for their heavy produce; which will enable them to sell at a low price, which will encourage both domestic and foreign consumption. And the variety of articles that may be expected to be carried on this canal, may be conjectured from the variety of articles mentioned in the table of rates, which is too long to be here enumerated.

**DUDLEY EXTENSION CANAL.**

The act for this canal was also obtained in 33 Geo. III. It joins the Dudley canal near Netherton, and making a bend round the high ground, comes to Windmill-end, and then passes through Combes Wood, by Hales Owen, at the foot of the celebrated Leasowes; soon after it enters a long tunnel, and proceeds by Weoley Castle to Selly Oak, Worcestershire, where it joins the canal now making from Birmingham to Worcester, being in length 10 miles and 5 furlongs, and level. There is a short tunnel near Combes Wood of 17 chains, but that beyond Hales Owen is nearly two miles long. There are two collateral cuts from the canal at Windmill-end, towards Dudley, with 64 feet fall.

The act authorising this canal begins by reciting certain clauses of the Dudley canal acts. 16, 25, and 30 Geo. III. names the new subscribers, and joins them with the old Dudley company, giving them similar powers and regulations. This is therefore only an extension of the Dudley canal; and this company are compelled to purchase the other proprietors shares, if they wish to part with them. The canal not to deviate more than 100 yards from the line proposed. No water to be taken from the rivers Rea and Stowr, and certain rivulets. Nor any water for this canal to be taken from any of the supplies of the Birmingham and Fazeley canal. Owners of fire-engines may take water from this canal.

The company are empowered to raise 90,000 *l.* to be divided into shares of 100 *l.* each; and 40,000 *l.* more may be raised, if wanted.

The Worcester and Birmingham canal company have agreed, that when any reduction of the usual rates for navigating the Worcester and Birmingham canal shall take place, a like reduction shall be made on goods, &c. passing on this canal, except such as go towards Birmingham. Then follows a very long list of rates and tolls, tonnage and wharfage, which is useless to the generality of readers.

A stop lock is to be erected within 500 yards of the Worcester and Birmingham canal to prevent loss of water, and to be stopped, if not kept level on both canals.

If by reason of making this canal, the profits of the Stourbridge canal shall be reduced below 12 *l.* each share, this canal company must make up all deficiencies, so as they do not exceed 3 *l.* per share, and they shall in the same year, receive by their rates 5 *l.* per share. The Worcester and Birmingham canal company are exonerated from that clause which makes them liable to make up any deficiency to the Dudley canal company.

This extension of the Dudley canal must be considered as a rival scheme to the Old Birmingham canal, which has long enjoyed a beneficial monopoly; and the Old Birmingham shares have decreased in value since this canal has been carried into execution.

#### ELLESMERE CANAL.

The act of this canal was obtained in 34 Geo. III. It joins the Severn on the north side of Shrewsbury, at Bagley-bridge, and taking a north course, passes Newton, Walford, Baschurch, Weston, Lullingfield, and Hordley; here a cut branches to Llany-mynech town and lime-works, being 12 miles; the



canal then passes Francton Common, from whence the Whitechurch branch commences, and passes Ellesmere, Welchampton, Whitechurch, and finishes at Prees Heath; this cut is 14 miles long; the canal is then continued and passes the Ridges, Old Martin, crosses the river Morlas, and soon after the river Ceriog, then it proceeds near to Chirk Castle, and crosses the river Dee at Pontoysyllte, by a noble aqueduct; it then goes on to Rhuabon, Newhall, Bersham, Wrexham, from whence Brombo' branch proceeds, which is  $3\frac{1}{2}$  miles; it then passes Gresford, whence a branch of four miles goes to Holt; from thence it passes Pulford in a direct line, and Leach Hall, and crossing the river Dee, passes on the west side of Chester, and then by Backford, Chorlton Croughton, Stoke, Stanney, Whetby, and there joins the river Mersey, being 57 miles long, with 537 feet lockage, which I shall particularly describe, in order to shew what may be done when neither hills, valleys, and rivers obstruct, nor interest and advantage are concerned. From the junction with the Severn at Bagley Bridge to Newton, is  $1\frac{1}{4}$  mile, with 110 feet rise; from thence to Francton Common is  $15\frac{1}{2}$  miles, and level; thence to Newmartin Common is  $3\frac{1}{2}$  miles, with 42 feet rise; thence to the river Dee is eight miles, and level; directly from thence is 75 feet rise, in half a mile; thence to the Brombo' branch is  $8\frac{1}{4}$  miles, and level, and the summit; thence to Chester is  $11\frac{1}{4}$  miles, and 380 feet fall; from thence to the Mersey is eight miles.

The Llanymynech branch is 12 miles, with 21 feet fall.

The Whitechurch branch is 14 miles.

The Brombo' branch is 3½ miles, and level.

The Holt branch is four miles, and level.

The Dee will be crossed by a noble aqueduct of seven arches, of 130 feet high, and 350 feet long; besides vast embanking; the ascent on the Welsh side is by three locks, and the descent on the Chester side is by four locks.

In the course of the canal there are two tunnels, one at Weston Lulling-field, 2 furlongs and 47 yards; the other near Chirk, of 3 furlongs and 115 yards.

The proprietors have the usual powers for making the canal and branches, not to deviate more than 100 yards from the line. No water to be taken from the rivers Perry and Belan, nor the Dee between Chester and the Mersey, but may use all springs and brooks within two miles, except as above. The breadth of the canal, &c. 24 yards.

The proprietors are allowed to raise 400,000*l.* and 50,000*l.* more, if wanted. Their shares to be 100*l.* each, and no person to have more than 10 votes.

The navigation to be open from 7 to 5 in the months of November, December, January, and February, and 5 to 7 in March, April, September, and October, and from 4 to 9 in May, June, July, August. No boat to pass any lock without leave, or not 60 feet long and 12 feet wide, or less than 30 tons burthen, or two boats 60 feet by 7 feet, and of thirty tons together, and pass at the same time, except in such parts of the canal as are made for boats of seven feet beam only and of 18 tons burthen.

For securing the river Dee navigation, that part of the canal which runs through the grounds of that

company is to be cut by them, but to be paid by the other company. If by means of this canal the Dee's company shall not yearly amount to 210*l.* it is to be made good by this canal company. The Chester water-works are indemnified from injury, and no water to be taken from Finchett's Gutter, except flood-water. The tolls of the Liverpool corporation are not to be affected. The company are empowered to extend the Whitchurch branch so as to form a junction with the Chester canal at a place called Crow's Nest in Tattenhall, but not without the land owner's consent; this branch will go by Malpas and Harthill. When this junction is formed the waste water of the Chester canal may be taken for the use of this canal.

The Llanymynech branch may be extended to Marda Bridge, near Oswestry, with consent of land owners. This branch is suspended till the report of Messrs. Dadford and Jessop, engineers, is obtained, but within two years.

The line of this canal is through a country abounding with slate, lime, coals, and other minerals, which, for want of water carriage, have hitherto lain dormant, but will now appear worthy of notice, and employ the labourer and mechanic. An inland navigation from the Bristol Channel to the Irish Sea will be completed by this canal, and Bristol and Liverpool will be, as it were, united, so that locally or commercially the benefits appear to be of the utmost importance.

Of the local benefits from Shrewsbury to Oswestry, the country having been supplied with coal and lime by land carriage, at a great distance and expense; the Llanymynech branch will supply fuel, lime, and

slate for the counties of Montgomery, Chester and Salop. The Brombo' branch will supply Mr. Wilkinson's iron works, which are of the utmost importance to this nation, and I may say to Europe. Bersham smelting works will be greatly accommodated, and must benefit the consumers, and the corn trade is very extensive. The Worrall part from Chester to the Mersey now promises to realise all expectations; a daily passage boat from Chester to Liverpool will be established, to the ease and comfort of the inhabitants of both towns and the intermediate country. This part of the canal is intended for vessels of 14 feet beam; the other parts for only 7 feet beam. A vast number of men are employed, and the work goes on amazingly rapid.

Nov. 1802. *Remarks on the Progress of Canals.*

The Ellesmere canal, a discount of 20*l.* It is a most tedious work, but will succeed.

#### RIVER FOSS NAVIGATION.

The act for this navigation was granted 33 Geo. III. It proceeds from the union of the river Foss with the river Ouse at York city, and continues with the river Foss to Farlington common, thence by a new cut to the lordship of Marton, and from that place to deepen, widen, &c. the river Foss to Stillington mill; the length near 13 miles. The powers are the same with other canal companies. A reservoir may be made on Oulston Moor, and the breadth allowed for the canal and rivers are 30 yards. The company are allowed to raise 25,400*l.* to be divided into 100*l.* shares, and they may raise 10,000*l.* more if wanted.

The principal use of this act appears to be intended for draining the low grounds on each side of the river Foss ; and commissioners are appointed with full powers for making drains, sewers, &c. and to compel payment for the same, as well as the rates, and adjust land claims.

#### GLoucester and Berkley Canal.

The act for this canal was obtained 33 Geo. III. It joins the Severn at a brook called Berkley Pill, opposite the town of Berkley, from whence in a straight line it passes Slimbridge, Frampton, Weat-enhurst, (where it intersects the Stroud canal) Hardwick, Quedgley, and terminates on the south side of the city of Gloucester, being  $18\frac{1}{2}$  miles. A short cut is made to the town of Berkley, and the whole is level ; there are locks at each end to preserve the water.

The company have the usual powers for making the canal, which is 70 feet wide, and 15 feet deep, and always kept properly cleansed, so as at all times to admit vessels of 300 tons burthen and upwards to navigate uninterruptedly. The breadth of ground allowed is 70 yards. Thirty-eight years purchase is to be given for the land wanted for the canal.

The company are allowed to raise 140,000 *l.* to be divided into 100 *l.* shares, and no person to hold above 30 shares, unless by will or act of law ; they have also liberty to raise 60,000 *l.* more if wanted. And before the canal is begun the company are to deposit 5,000 *l.* in the hands of four trustees, who are to lodge it in the Bank of England, to answer any demands for damages that may be incurred.

Exemption from rates, all manures for land, and gravel or stones for roads, as usual.

The company are to make and keep in repair a wharf at the end of the cut at Berkley; the wharfage to belong to the land owner of the wharf; but if goods are landed there the company are to receive their just rates.

No water is to be taken from the Stroudwater canal, nor Stroudwater river, nor from any springs that supply the same; and to prevent loss of water from the Stroud canal, gates are to be erected where the canals intersect each other.

No dues to be taken for boats crossing either canals, and a gate-keeper is to be appointed. Five guineas per day are to be paid by this company to the Stroudwater company if their navigation is stopped by any works doing on this canal; and also a compensation for any interruption to the Thames and Severn companies of two-thirds of loss per day, to be averaged from the six preceding months. One month's notice to be given if such interruption is intended, and to be advertised in the Bristol and Gloucester news-papers.

This canal for magnitude and accommodations must be allowed of the first consequence, from its admitting vessels of 300 tons burthen, uniting the city of Gloucester to the port of Bristol, by a cheap, certain, and easy water-carriage, thereby becoming a material object to trade. The whole of this vast scheme, which can be known only in a free country, shews an ardour of enterprise, which none but an industrious and commercial people could sustain.

By this canal the voyage may easily be performed in one day, whereas to get to Gloucester by the river,

though only ten miles more, was the work of many days.

#### GRAND JUNCTION CANAL.

The act, or rather acts of this magnificent and wonderful undertaking, were obtained 33 and 34 Geo. III. It is proper to describe its course particularly, as it unites so great a length of interior country so near to the metropolis. This canal begins at Braunston, in Northamptonshire, on the borders of Warwickshire, and at the extremity joins the Oxford canal. From Braunston it passes a tunnel, and its course is between Welton and Daventry, with a cut one mile and half to the latter place, leaving Long Breckby to the left, passes through Weedon, by Lower Heyford, Bugbrook, to Gayton, where it goes off by a cut 5 miles to Northampton. From Gayton it passes Blisworth, and through a tunnel to Stoke, then passes Grafton and Cosgrove, a little below which a branch goes off to Stoney-Stratford, of one mile and half; below this is the junction of the river Ouse, which it crosses, then passes Great Dinford, and is distant from Newport Pagnell about a mile; it then passes Little and Great Wolston, Woughton, Simpson, through the town of Fenny Stratford, by Stoke Hammond, Soulbury, Linslade, Leighton Buzzard, Marsworth, Ivinghoe, Pottleshom, Tring, one mile and half distant, Aldbury, Northchurch, close to Berkhamsted, Hemel, Hempsted, about a mile distant, King's Langley, whence, through a small tunnel, it goes by Grove Park, and Cashibury Park, to Rickmansworth, a little before which a branch of two miles goes to Watford; from Rickmansworth it runs parallel with

the river Colne, which it crosses several times, to Uxbridge; from thence it goes by Cowley and Hillingdon, Drayton, Harlingford, Cranford Park, Norwood and Osterly Park, where, intersecting the river Brent, it falls into the Thames between Brentford and Sion House, completing a course of 90 miles, with 796 feet lockage, and through 3 tunnels.

The particular rises, falls, and distances may be entertaining to the reader. From the junction with the Oxford canal at Braunston, near a mile, is 37 feet rise; to above Whilton mill, and below the road from Daventry to Long Buckby  $4\frac{1}{4}$  miles, and level; from thence, below the road from Daventry to Whilton, is 5 furlongs 5 chains, and falls 60 feet; thence to Stoke  $12\frac{1}{4}$  miles, and level; between Blisworth and Stoke is a tunnel  $1\frac{1}{4}$  mile long; from Stoke to the junction with the branch to Stratford is  $6\frac{1}{4}$  miles, and 112 feet fall; thence to Marsworth above Tring 25 miles, and 192 feet rise: from thence to Cow Roasts  $3\frac{1}{4}$  miles, and level. This is the highest level in the whole course of the canal, being 28 feet higher than the tunnel at Braunston, and 400 feet higher than the level of the Thames, and regular descent. From Cow Roast to two waters, near Hemel Hempsted, is near 7 miles, and 127 feet fall; thence to Langley Bury  $4\frac{3}{4}$  miles, and level, including the tunnel, which is not half a mile; from thence to the junction of the Thames near 24 miles, and 268 feet fall, of which 60 feet is by the side of Osterly Park; the cut to Daventry has 60 feet rise. That to Northampton 120 feet fall. That to Stratford has one lock up, and the cut to Watford is level.

The company have the usual powers, and the ground allowed is 20 yards, but where deep cutting,



warehouses, basons, &c. are necessary, 45 yards may be taken. The canal, as usual, is not to deviate more than 100 yards from the line laid down. If one eighth of a mile be cut through, the land-owner may be a proprietor, and have one share, but no one to have more than 10 shares.

The towing-path through Osterly Lands, and those of John Robinson, esq. the Duke of Northumberland, and James Clitherow, esq. is to be north, north-east, and east side of the canal; nor is any water to be taken or diverted from those lands for the use of the canal. Reservoirs are to be provided for supplying the rivers Gade, Colne, and Bulbourne, with the same quantity of water as may be taken from those rivers for the use of the canal, as also to the river Brent. The waste water from the summit at Marsworth is to be conveyed southward, and not to impede the navigation of the Brent, nor to interrupt the owners of wharfs, warehouses, &c. who are not to pay any rates or tolls of this canal, not even the city duty of one halfpenny per ton. This exemption to reach no further than from the Thames to Bax's mill, which mill also is not to be injured. The pipes that supply water to Uxbridge and Hillington are not to be damaged.

The water of the canal is to have no communication with the river Colne from the point to Uxbridge; and the canal is to cross the Colne in aqueducts, sufficiently high for the river to flow for the use of the mills above the point. All surplus water between Uxbridge and the Brent to be conveyed to Cranford Brook. The canal is not to unite with the Colne below Uxbridge, but to cross it by aqueducts; a tumbling bay is to be erected above the point

to preserve the water of the river Colne. No water to be taken from the stream that supplies Smewne's paper mill at Soulbury, in Bucks; nor from any streams that flow into the Thames and Isis above Dorchester bridge, unless the company replenish the same from reservoirs. All the soil dug out in the whole course of the canal, to be spread on the adjoining grounds at the expense of the company.

To complete this canal, the company are empowered to raise 500,000 *l.* to be divided into shares of 100 *l.* each, for which a ticket, with the number and also the common seal of the company, shall be given, paying the clerk half a crown; and if the first sum is not sufficient, they are allowed to raise 100,000 *l.* more. On the second Tuesday in May and November annually, are to be two general meetings, at a place appointed by advertisement, when a general committee is to be chosen of 21 persons, not having less than five shares as a qualification; and if other committees should be found necessary, they are not to consist of less than nine persons. At every general meeting, persons possessing 1000 *l.* shares to be present. Exemption from rates and tolls, officers and soldiers on their march, with their horses, arms, and baggage; timber for the use of his Majesty's navy, or any stores, &c. belonging to the navy or military service; gravel for roads, and manure for land.

The navigation to be free on paying the rates, &c. and open between the hours of seven and five in the months of November, December, January, and February; and between the hours of five and seven in the months of March, April, September, and October; and between the hours of four and nine in May,

June, July, and August ; provided that no boat less than 60 feet long, and 12 feet broad, or of 30 tons burthen, do pass any lock without consent, or paying for 30 tons, unless the water flows over the weir ; or there not being sufficient depth of water in the locks, to pay no more than the water will let them carry. All fractions of a mile to be deemed a mile, but fractions of a ton as quarters of a ton.

The making of this Grand Junction canal it is apprehended will injure the Oxford canal company. It is agreed, that if the tolls before mentioned do not amount to 5,000 *l.* a year, after it shall be completed from the Oxford canal to Old Stratford, then the deficiency of that sum shall be made good by this company : and further, if it shall happen that after this canal shall be completed from the Oxford canal to the river Thames, or after the first of January 1804, the rates above-mentioned shall not produce to the Oxford canal company 10,000 *l.* a year, the deficiency of such sum shall be made good by this company within three months after the year is expired, provided the Oxford canal company keep their canal always in good condition.

The toll of one halfpenny per ton due to the city of London upon all vessels navigated on the Thames westward of London, is to be collected by this canal company in addition to all other tolls, on all vessels going into or out of this canal ; and the said company are to pay to the city of London, for the better improvement of the river Thames, an additional rate of one halfpenny per ton upon all goods that shall pass into or out of this canal. And it is further enacted, that if the said halfpenny toll to the city of London, and the additional halfpenny toll granted by this act, shall not amount to 200 *l.* from the 30th of April

1790, to Midsummer 1795, and to 500 *l.* in 1796; and to 600 *l.* in 1797, and to 700 *l.* in 1798, and to 800 *l.* in 1799, and to 900 *l.* in 1800, and to 1,000 *l.* in 1801, and the same every subsequent year, the company are to make good the above several sums.

No coals, culm, or cinders are to be brought by this canal nearer to London than the mouth of the tunnel at Langley-Bury, on the penalty of 500 *l.*

By the act of 34 Geo. III. chap. 24. the Grand Junction canal company are authorised to make a cut from the town of Buckingham to join the branch of the canal at Old Stratford, and also another cut from Aylesbury to join the canal at Marsworth, which is two miles above Tring; and likewise to make navigable the cut or feeder from the town of Wendover, to join the canal at Bulbourne, one mile above Tring, with all the powers of the first act of 33 Geo. III.

Mr. Sheppard, of Thornton, Bucks, or the occupier, is permitted to use pleasure boats, and to pass the locks at Thornton Mill near adjoining, without paying any rates of tonnage.

The further regulations of the act respecting the managing of the company's affairs, proxies, meetings, claims, forfeitures, transfer or sale of shares, &c. &c. &c. being useless to the generality of readers, is consequently omitted.

In describing the route of this canal I have been more particular than usual, as well from the great advantages expected from it, as from the number of land-owners and proprietors concerned in it, and also from the great interest the city of London will have in it; its course is altogether through countries well cultivated and populous; many and great are the

advantages to be expected from it, as well in the neighbourhood of its course as to the metropolis. The various and valuable produce of a canal 90 miles in length through the heart of the kingdom, will doubtless produce unusual benefits to the inhabitants of London and Westminster.

Nov. 1802.—*Remarks on the progress of Canals.*

The Grand Junction canal fluctuates as usual. The shares of 100 l. have been as high as 210 l. and as low as 65 l. they are now at 150 l. Want of water is the present complaint. Its extension to the Thames will be liable to much discussion, but it must finally take place,

An act relative to the Grand Junction canal was obtained 24th March 1803, for amending, altering, and enlarging the powers of six acts of Geo. III.

Whereas by an act, passed in the 33d year of the reign of his present Majesty King George the Third, intituled, An act for making and maintaining a navigable canal from the Oxford canal navigation at Braunston, in the county of Northampton, to join the river Thames at or near Brentford, in the county of Middlesex, and also certain collateral cuts from the said intended canal, certain persons therein named were incorporated by the name and style of The Company of Proprietors of the Grand Junction Canal, for making the said canal and collateral cuts, and the several other works necessary for carrying the said act into execution, and were thereby authorised to raise certain sums of money therein mentioned towards defraying the expenses thereof: and whereas by several other acts passed in the 34th, 35th, 36th, 38th, and 41st years of the reign of his present Majesty, certain powers and authorities

were granted to the said proprietors for enabling them to make certain collateral cuts from or out of the said canal, and for executing other works therein mentioned, and also for raising several further sums of money for discharging the debts of the said company, and for completing the said canal and collateral cuts; which said several sums of money have been raised and expended in discharge of the debts owing by the said company, and in the execution of the several works before mentioned: and whereas the several communications from Braunston to London, and part of the collateral communications by the said recited acts authorised to be made, have been completed, together with such wharfs, warehouses, and other works, at Paddington, as are therein directed, for the accommodation of the public trading upon and using the same: and whereas it has been represented to the said company of proprietors, that by executing a tunnel, in addition to the rail road at Blisworth already completed, and by constructing an aqueduct over the river Ouse at Wolverton, and by making certain other provisions and accommodations on the line of the said canal, additional safety and expedition in conveyance of all kinds of goods, wares, and merchandise, would be secured to the public: and whereas the said company of proprietors are desirous to execute the said tunnel, aqueduct, and other works as aforesaid, and for that purpose to raise among themselves, by subscription of the holders of shares, half shares, and loans in the said undertaking, sufficient sums for the execution thereof; but that such beneficial purposes cannot be effected without the aid and authority of Parliament; and it is expedient that the powers and provisions of the

said recited acts should be amended, altered, and enlarged: be it enacted, That it shall and may be lawful for the said company of proprietors of the Grand Junction canal, and they are hereby authorised and empowered to raise, in manner hereinafter mentioned, the further sum of 400,000 *l.* and to borrow or take up the same at legal or less interest, from such persons as shall be willing to advance and lend the same; and the money so to be raised shall be applied in defraying the expences of obtaining and passing this act, and all other expenses relating thereto, and of carrying on and completing the several works authorised to be done and completed by virtue of any act or acts of Parliament now in force for making and completing the said canal and navigable cuts; and the said sum of 400,000 *l.* or such part thereof as the said company of proprietors, or the committee of the said company for the time being, shall think proper, shall or may be raised, by all, any, or either of the ways or means by which the said company of proprietors are authorised to raise any money by virtue of the said recited acts, or any or either of them: and that all and every the powers contained in the said several recited acts, with respect to the borrowing and securing such sum or sums of money, and the application thereof, shall be extended to this act, as fully and effectually as if the said several powers were repeated and re-enacted in the body of this present act.

II. Provided always, That it shall and may be lawful for the said company of proprietors, or their general committee for the time being, to raise the said sum of 400,000 *l.* or such part or parts thereof as they shall from time to time think fit, by creating

new or additional shares of 100 *l.* each, or half shares of 50 *l.* each, or quarter shares of 25 *l.* each, or eighth parts of shares of 12 *l.* 10*s.* each, or any or either of them, and disposing of the same to such person or persons, and at such price or prices, as to the said company of proprietors shall from time to time seem meet; and that the respective proprietors of any shares,  $\frac{1}{2}$  shares,  $\frac{1}{4}$  shares, or  $\frac{1}{8}$  parts of shares, which shall or may be created by virtue of this act, shall be entitled to such and the same powers, privileges, and advantages, and be liable to such and the same restrictions, penalties, and forfeitures, as if the same were part of the shares or half shares already created, and now vested in the several and respective proprietors of the said Grand Junction canal; and the admission of every person to any such new shares, half shares, quarter shares, or eighth parts of shares, by any order or resolution of the said company of proprietors, or the general committee for the time being, shall be good and effectual titles to such person or persons, and his, her, or their respective executors and administrators, on his, her, or their payment to the said company of the purchase money or price agreed for the same.

III. And whereas the constructing, erecting, and making the said tunnel at Blisworth, and aqueduct over the river Ouse, and the other works as aforesaid, will be attended with a very considerable expense to the said company of proprietors; be it therefore enacted, That it shall and may be lawful for the said company of proprietors, for and in consideration of the same, to ask, demand, take, recover, and receive, to and for their own proper use and behoof (over and above the rates of tonnage and



wharfage they are entitled to receive), the additional rates herein-after mentioned; that is to say,

For all coal and coke, lime, limestone, flint and other stones, and all bricks, tiles, slate, sand, and fullers earth, and all ironstone, pig iron and pig lead, and all kinds of manure, which shall be carried or conveyed upon the said canal into or through the said proposed tunnel, or the deep cutting at the two mouths or entrances of the same, the additional sum of 8*d.* per ton; and for all other goods, wares, merchandise, and things whatsoever, the additional sum of 1*s.* 4*d.* per ton.

For all coal and coke, lime, limestone, flint and other stones, and all bricks, tiles, slates, sand, and fullers earth, and all ironstone, pig iron and pig lead, and all kinds of manure, which shall be carried or conveyed over or upon any part of the said aqueduct, the additional sum of 4*d.* per ton; and for all other goods, wares, merchandise, and things whatsoever, the additional sum of 8*d.* per ton.

Which said additional rate or rates shall be paid by the person having the care or conduct of every boat, barge, or other vessel, which shall pass upon the said canal into or through the said tunnel or deep cuttings, or over or upon the said aqueduct, at such place or places as the said company of proprietors shall appoint for that purpose, and shall and may be recovered and applied by such ways and means, and in such manner, as the rates of tonnage and wharfage granted by the said recited acts, or any of them, are to be or may be recovered and applied; and in all cases where there shall be a fraction of a ton in the weight of lading in any boat or other vessel so to be navigated into or through the said tun-

nel and deep cuttings, or over or upon the said aqueduct, or either of them, a proportion of the said rates shall be demanded and taken by the said company of proprietors for such fraction, according to the number of quarters of a ton contained therein.

IV. And be it further enacted, That the general committee of the said company of proprietors shall have full power, from time to time, to lower or reduce all or any part of the said rates upon all or any or either of the articles which shall be carried upon the said canal, and to raise the same again to such sum as they shall think proper, not exceeding the rates before mentioned, as often as they shall deem it necessary so to do for the interest of the said navigation.

V. And whereas certain rules are established by the said recited act of the 33rd year of the reign of his present Majesty, for ascertaining the weight of timber and other articles conveyed in or upon the said canal, which rules are liable to great uncertainty; for remedy whereof, be it enacted, That the tonnage for timber, and all other goods, merchandise, and things whatsoever, shall be ascertained and charged according to the real weight thereof, and that 112*lb.* avoirdupois shall be deemed and taken as and for 100 weight, with respect to all timber, and other goods, merchandise, and things whatsoever; any law, custom, or usage to the contrary in any wise notwithstanding.

VI. And whereas by the said act passed in the 33rd year of the reign of his present Majesty, the company of proprietors of the Grand Junction canal, are authorised to make and maintain a collateral communication (by such cuts, rail-ways, or other

ways and means, as therein mentioned) to branch from and out of the Grand Junction canal, in the parish of Gayton, to join the navigation of the river Nen at the town of Northampton : And whereas it is expedient that such collateral communication should be made and completed on or before the 25th day of March 1805 ; be it therefore, and it is hereby enacted, That the said company of proprietors shall, and they are hereby required and directed to cause such collateral communication as aforefaid to be made and completed on or before the said 25th day of March 1805.

VII. And it is hereby further enacted, That out of the sum of money authorised to be raised by this act, a sum sufficient to defray the charge and expense of making and completing such collateral communication from the said Grand Junction canal, in the parish of Gayton, to join the navigation of the river Nen at the town of Northampton as afore-said, shall be, and the same is hereby required and directed to be appropriated and applied solely and exclusively to the making and completing the said last mentioned collateral communication.

VIII. And be it further enacted, That the charges and expenses attending the obtaining and passing this act, shall be paid by the said company of proprietors ; and that this act shall be deemed and taken to be a public act, and shall be judicially taken notice of as such by all judges, justices, and other persons, without specially pleading the same.

#### GRANTHAM CANAL.

The act for this canal was obtained 33 Geo. III. It begins on the east side of Grantham, in Lincoln-

shire, and passes Harlaxton, the Point, at the foot of Woolsthorp Hill, Stainwith, Redmile, along Belvoir Vale, by Barkestone, Plungar, Harby, Long Clawson, to Hickling; from thence it passes through Kinnoulton, Coulton Basset, Cropwell Bishop, and joins the Trent between Holme-Pierrepont and Radcliffe, in Nottinghamshire. There is a branch from Cropwell Bishop to Bingham.

From Grantham to the Trent by this canal is 30 miles, and 148 feet fall to the river Trent, viz. from Grantham to Woolsthorp Hill is five miles, and level; thence to Stainwith Close is  $1\frac{1}{2}$  mile, and  $58\frac{1}{2}$  feet fall; from thence along Belvoir Vale, is 20 miles, and level, to Cropwell Bishop; and from thence to the Trent is  $3\frac{1}{2}$  miles, and  $89\frac{1}{2}$  feet fall. The branch to Bingham is above three miles, and level.

The company have the usual powers to make the canal. No water to be taken from the river Witham feeders, except the flood waters of Denton Brook, which must be turned into a reservoir to be made at Denton of 20 acres, and three yards deep; this is intended to supply the head level. Another reservoir is to be made between Branstone and Knipton, of 60 acres, and to receive only the flood waters of the river Devon, and any other waters within half a mile, and to be always nine feet deep in water. In passing the parishes of Woolsthorp, Stainwith, Muston, Bottesford, and Redmile, the canal is not to deviate more than 50 yards from the line laid down, without leave from the Duke of Rutland; but in all the other course 100 yards as usual is allowed. The canal and towing-path, drains, ditches, banks, &c. not to exceed 24 yards in breadth.

The company are allowed to raise 75,000 *l.* divided into 100 *l.* shares, and may raise 30,000 *l.* more if wanted. No person to have above 10 shares.

Exemptions, that Charles Pierrepont and John Musters, esqs. and the other proprietors, their heirs and tenants of estates, within the parishes of Nottingham, West Bridgford, Adbolton, Gamston, Bassingfield, Cotgrove, Clipston, and Cropwell Butler, whose lands the said canal shall pass through, between the first day of November and the first day of May yearly, shall be exempted from the gross tonnage of 2*d.* charged on entering into or passing out of the canal, at the junction with the Trent, on all goods, wares, &c. which shall be for their own private use, and not for sale, and navigated only between the river Trent and Hollowgate Lane, in the lordship of Cotgrove.

The profits are not to exceed eight per cent. and when 3,000 *l.* at that rate is accumulated, the rates, tolls, &c. to be lowered.

The proprietors of the river Trent navigation are to take away the shallows, and lower the bed of that river, so that at the driest season there shall be 30 inches depth of water between the Nottingham canal and this canal, and between Nottingham Trent-bridge and this canal. This canal will greatly accommodate the town of Grantham. The coals, lime, &c. by the Cromford and Nottingham canals, will have a cheap and easy carriage; and on timber, corn, and many other articles which now come by land-carriage, the difference to that town only will be very great.

**HEREFORD AND GLOUCESTER CANAL TO ALTER.**

An act to vary this canal was obtained 33 Geo. III. to authorise the company to alter the act of 31 Geo. III. before mentioned. The main alteration is, to bring the course of the canal by a tunnel through the high ground about Oxenhall, from Dimmock, by Oxenhall, Newent, Taynton, Tibberton, and Rudford, by which means a large circuit of canal, and the collateral cuts to Newent, will be saved. By this act any water within 300 yards may be taken for the use of the tunnel, and the waste water made to go into Newent brook, and from thence into the river Leadon. Another alteration is, to shorten the canal at crossing the river Lugg at Sutton St. Nicholas, and Shelwick. The canal is likewise to go nearer to Hereford, almost to Byster's Gate.

**LANCASTER CANAL, TO EXTEND.**

By the act 33 Geo. III. which is an addition to a former act, the proprietors are authorised to make a cut from the dock at Glasson at the mouth of the river Loyne, to unite with the canal at Galgate, which is six miles from Lancaster. The cut will be four miles in length, and have a direct communication with the sea. The same tonnage is allowed as on the main line.

The company are restricted from obtaining water from the river Loyne, except for an aqueduct over that river; they are also debarred from taking water from the river Wyer. They may have water from mines within 2000 yards of the canal gratis; and water raised by fire-engines, is to be given for the uses of this canal.

The aqueduct over the river Loyne, near Lancaster, is the most capital thing of the kind in England, if not in Europe ; it consists of five arches of 70 feet span each.

#### MANCHESTER AND OLDHAM EXTENSION.

This act was granted in 33 Geo. III. and empowers the Manchester and Oldham canal companies to make a navigable cut for boats, barges, &c. from the Manchester and Oldham canal, at Clayton Demesne, in the parish of Manchester, to opposite the Three Boars Heads at Heaton Norris, near Stockport, which is six miles ; also to continue this canal northward, from Taylor's Barn to Denton, about three miles ; also from the aqueduct near the water-houses on the Oldham branch, to make a canal to Stake Leach, at Hollingwood, about two miles.

This act consolidates this company with the Oldham and Manchester canal company, and gives the usual powers for making cuts, not deviating above 100 yards from the line laid down. The company may raise 30,000*l.* divided into 100*l.* shares, and no one to hold more than 30 shares.

#### NUTBROOK CANAL.

This act was also obtained in 33 Geo. III. and the canal commences at the Shipley and West Hallam collieries, in Derbyshire, and going by Kirk Hallam joins the Erewash canal, at or near Stanton. The length is five miles, and is the private property of Sir Henry Hunloke, bart. and Edward Miller Mundy, esq. the owners of the collieries.

This canal is called the Nutbrook canal, and the proprietors have the usual powers. The canal,

towing-path, &c. is 20 feet wide; 13,000 *l.* may be raised by subscriptions, divided into 100 *l.* shares; and 6,500 *l.* more may be raised if the first sum is not enough.

Exemption. Earl Stanhope, or his tenants of Stanton-by-Dale, and Dale-Abbey, may carry on this canal free of all rates, iron-stone, coal and coke, and also all goods, wares, and merchandise, that may be used in the before-mentioned two parishes, and any iron-stone that may be got in the lordships of Shipley, Mapperly, West-Hallam, Kirk-Hallam, Ilkestone, and Little-Hallam.

The principal use of this canal will be to the collieries of Shipley, and West-Hallam, but ultimately the public will be greatly benefited by a cheap and easy conveyance of that useful article, fuel.

#### OAKHAM CANAL.

The act for this canal was granted in 33 Geo. III. It begins at and joins the Melton-Mowbry navigation, in Leicestershire, and proceeds by the north side of the river Eye, passes Brentingby, Wiverby, Stapleford, Saxby, Wymondham, Edmondthorpe, Teigh, Market-Overton, Barrow, Cottesmore, Burley, and joins the town of Oakham, in Rutlandshire, on the north side, running a course of 15 miles, with 126 feet rise in the first  $8\frac{1}{2}$  miles to Edmondthorpe; from thence to Oakham is level; the reservoir is near Langham.

The company have the usual powers. The water of Scafford-Dyke is preserved to the mill, called the Two-Eyed-Mill, at Melton; the flood water only of Langley Brook is to be taken for the reservoir; no water to be taken from the springs, &c. in the



grounds of Lord Harborough, in Saxby and Wymondham, without returning the same quantity from the canal, nor is any water to be taken from Thorpe brook.

The breadth allowed for the canal, towing-path, &c. is 20 yards, and the towing-path to be used as a bridle-way by occupiers of lands. The soil, &c. dug out of the canal to be levelled on the adjoining land. The company are allowed to raise 56,000 *l.* to be divided into 100 *l.* shares, and they have liberty to raise 20,000 *l.* more, if that first sum is not sufficient.

The company are obliged to pay the Earl of Winchelsea 15 *l.* a year, in lieu of his Lordship's dues on coals sold at Oakham.

The extending this canal through a populous and well-cultivated country must be of the utmost benefit to the inhabitants at large, and all the commerce and produce by the north canal will have conveyance to Oakham, the capital of Rutlandshire.

#### SHREWSBURY CANAL.

The act for this canal was obtained 33 Geo. III. It commences at Shrewsbury, and winding with the Severn, passes Uffington; from thence it goes parallel with the river Tern, and passes Upton Forge, Withington, Rodington, where it crosses the river Roden, and shortly after crosses the Tern river, at Long Mill, passes Langdon and Eyton, and then crosses Ketley brook at Rockwardine wood, in Shropshire, and it there joins the Donnington and Shropshire canals. The length of this canal is  $17\frac{1}{4}$  miles, with 147 feet rise in five miles which is be-

tween Langdon and Wombridge, the remainder is level.

The company have the usual powers, and liberty also to purchase one mile and 188 yards of Mr. Reynolds on the Ketley canal, for 840 *l.* being a moiety of the original cost, which is afterwards to be deemed a part of the Shrewsbury canal. The junction is formed at Wombridge, and is to be looked on as a collateral cut. This canal, towing-path, &c. is 26 yards broad. The company are empowered to raise 50,000 *l.* distributed into shares of 100 *l.* each, and 20,000 *l.* more may be raised if wanted.

The number of coal and iron mines in the neighbourhood of the whole line of this canal is immense; and the cheapness of carriage by it will greatly benefit the owners as well as the manufacturers, and also the rich, flourishing, and populous town of Shrewsbury.

#### STRATFORD CANAL.

The act of parliament for this canal is also of 33 Geo. III. It joins the Worcester and Birmingham canal at King's-Norton, about six miles from Birmingham; from its junction it takes its course to Yardley Wood common, it then passes Shirley Street, Monkford Street, Lapworth, Preston Bagot, where it crosses the river Alne; thence by Wootten to Stratford-upon-Avon, but not into that river. There is a branch runs by Billesly to the stone quarries near Temple Grafton, and another to the quarries near Tanworth. The canal is  $24\frac{1}{4}$  miles long without the branches, and has 309 feet fall to Stratford; viz. from King's-Norton to near Horkley Heath, 10 miles level; thence to Lapworth Hall  $2\frac{1}{4}$  miles, and

147 feet fall ; thence to Preston Green one mile, level ; thence to Preston Mill  $1\frac{3}{4}$  mile, and 76 feet fall ; thence to Wilmcote six miles, level ; thence to Stratford  $2\frac{1}{4}$  miles, and 86 feet fall in the first mile, the rest is level. The branch to Tanworth is  $2\frac{1}{4}$  miles, and level ; and the cut to Grafton Field is four miles, with 20 feet rise in the last mile and a half.

The company have the usual powers ; the canal, towing-path, &c. are 20 yards wide ; they are empowered to raise 120,000 *l.* in 100 *l.* shares, and allowed to raise 60,000 *l.* more if wanted. Stop-gates must be erected on this canal when within 500 yards of the Worcester and Birmingham canal, which may be shut and locked up, if the water shall be lower in this than in the last-mentioned canal.

The Worcester and Birmingham canal company are obliged to pay George Perrot, esq. as a recompence for his dues on the river Avon, 400 *l.* per annum, which is the damage supposed he will sustain by this canal ; and the Worcester and Birmingham canal company are to pay to the said George Perrot, esq. the deficiency of his present yearly rents of 1227 *l.* payable for the lower navigation of the river Avon, by the present tenants, but on condition that they cannot be let for that money after this act is passed.

The course of this canal crosses a country plentiful in lime-stone and minerals, which will have a ready water-carriage to Birmingham by their canal ; the other end of the canal falling into the river Avon at Stratford, will have a direct water conveyance to the Severn and its unbounded connections, which cannot fail to be of the utmost consequence to the land and mine-owners on the canal.

**STAINFORTH AND KEADBY CANAL.**

This is another act obtained in the 33rd Geo. III. for cutting a canal which begins at the river Dun, within a mile of Fishlake, and goes parallel with that river to opposite Thorn; whence, in a direct line, it passes Crowle and Keadby, where it enters the Trent, in Lincolnshire. There is a cut of a mile long across Thorn common, to Hangman Hill, and which joins the river Dun. This canal is near 15 miles long, and going through fenns chiefly, is without fall or lockage, except out of the rivers at each end. The company have the usual powers, and are authorised to raise 24,000 *l.* in shares of 100 *l.* each, and 12,100 *l.* more if wanted. The ground allowed for the canal, towing-path, &c. is 100 yards broad, and a reservoir of five acres is allowed to be made on Thorn common.

The waste water of this canal is to be conveyed into the Trent. This canal is chiefly local, for carriage of coals, timber, corn, &c. into the country bordering on the canal, and by the Trent to Gainsborough and Hull, and to other markets.

**STOWMARKET AND IPSWICH NAVIGATION,  
TO AMEND.**

This is another act of the 33rd Geo. III. The proprietors of this navigation are empowered to raise for that purpose 15,000 *l.* in order to increase the sum of 14,300 *l.* before allowed; that sum not proving sufficient for carrying the extensive improvement into execution.

## ULVERSTONE CANAL.

This act was also obtained 33 Geo. III. This cut or canal is only  $1\frac{1}{4}$  mile long, and chiefly intended to accommodate the town of Ulverstone, in Lancashire, by having a direct union with the Irish Sea, with a basin and wharfs for shipping and merchandise. The lock is 112 feet long, and capable of receiving a large ship; the canal is 65 feet wide at top, and 30 feet at bottom, with 15 feet depth of water, and a proper towing-path.

The company are empowered to raise 4,000*l.* to be divided into 50*l.* shares, and may raise by loan 3,000*l.* more if wanted. The company are to build a public bridge over the canal at Hammerside Hill, and the Lancaster canal may join with this. Coals, culm or cinders that shall be carried into this canal from the Lancaster canal are to pay no sea duty.

## UNION CANAL.

The number of acts obtained in the session of 33 Geo. III. did not prevent another for this canal, which begins at and joins the river Soar navigation at Leicester, and goes to Aylstone, 3 miles nearly parallel with that river; from Aylston it passes Glen Parva, Wigston, Newton Harcourt, Wistow and Saddington, where it makes an elbow through a tunnel of 40 chains and passes Foxton, and then goes through another tunnel of 48 chains, from which extremity is a cut to Market Harborough; from the last tunnel it makes another bend, and crosses the river Welland, passing between Marston Trussel and Hothorp, and turns to East Farndon and great Oxenden, where it goes through a tunnel of only

13 chains; near this place is the reservoir for the summit to be supplied by Oxenden brook; from hence it proceeds to Kelmarsh, where is another tunnel of 45 chains; then goes by Maidwell, Lamport, Hanging-Houghton, Brixworth, and parallel with the northern branch of the river Nen by Spratton, Pissford, Chapel Brampton, Kingsthorp, Dallington to Northampton, into the river Nen navigation, and the Grand Junction canal, finishing a line of  $43\frac{3}{4}$  miles, from Leicester to Northampton, with 407 feet 6 inches lockage, and going through 4 tunnels. The cut to Market Harbro is  $3\frac{3}{4}$  miles and level, the particulars of the rise and falls are as follows. From Westbridge, at Leicester, where it joins the river Soar, to Saddington  $12\frac{3}{4}$  miles, and 160 feet rise; from thence to Great Oxenden  $13\frac{1}{4}$  miles, and level; in one furlong at this place is a rise of 50 feet to the summit, which is 5 miles to the tunnel at Kelmarsh; thence to the joining the north river at Northampton is  $11\frac{3}{4}$  miles,  $197\frac{1}{4}$  feet fall; thence to join the Nen  $\frac{3}{4}$  of a mile level.

This company, like others, have the proper powers for making canals, and are authorised to raise 200,000*l.* in 100*l.* shares as usual, and may raise 100,000*l.* more if wanted. No water for this canal to be taken from the estate of Lady Denbigh, nor from the brook at Kelmarsh to injure Mr. Hanbury's estate, nor from the springs on Thomas Pares', Esq. estate; nor more from the mill at Aylston, than will be wanting for the trade of that place; nor from the water of the cotton mill at Northampton. The breadth of this canal and towing-path, &c. is 20 yards, and not to deviate above 100 yards from the

line ; the soil dug out to be spread and levelled at the company's expense.

The company guarantee to Lord Harborough, that the profits of the weighing engine at Market Harbro shall not be less than 120*l.* a year.

They likewise guarantee to the living of Langton 600*l.* a year, according to the act of 31 Geo. III. for enclosing the parishes of East and West Langton. A canal that is intended from Uppingham, in Rutlandshire, is permitted to unite with this canal.

The course of this canal is of the utmost consequence ; its union with the Grand Junction canal consequently unites the Yorkshire, Derbyshire, Grand Trunk, rivers Trent and Thames, besides passing through the populous commercial and manufacturing countries and towns.

#### WARWICK AND BIRMINGHAM CANAL.

This act was likewise obtained 33 Geo. III. The canal begins on the verge of the town of Warwick, passes Budbrook, Hatton, Rowington, Badesley, Clinton, Knowle, Solihull, Yardley, and joins the Digbeth cut of the Birmingham and Fazeley Canal at the edge of Birmingham town, being 25 miles in length. The company have the usual powers, and by agreement may join the Birmingham and Fazeley canal, on keeping this canal level with the other canal where the union is formed, and never drawing the water lower than four feet without consent. Also all goods, wares, and merchandise going into or out of the Birmingham and Fazeley canal to pay to that company a tonnage as mentioned in the act.

The ground for the canal, t<sup>r</sup>ing-path, &c. is 30 yards broad, and not to extend more than 100

yards from the line. No water to be taken from the river Rea, nor from the supply of Olton mill to its prejudice. The company are allowed to raise 100,000*l.* in 100*l.* shares as usual, and if wanted 30,000*l.* more.

No boat less than 70 feet long, and 20 tons burden, to pass any lock without leave ; but boats 5 feet broad, not carrying for hire, but entirely used for the purpose of husbandry, are to be free of rates, but not to pass locks.

Nothing more fully shews the enterprising genius of the inhabitants of Birmingham, than the number of canals cut from that town in every direction ; and nothing more evinces the utility of inland navigations, than the assiduity with which these people strive to accommodate themselves and the public.

The Avon navigation goes no farther than Stratford, and till the present period there has been no water carriage to Warwick ; but by this canal they will be amply supplied with coals from Wednesbury colliery cheap, as also with all kinds of minerals.

#### ASHBY-DE-LA-ZOUCH CANAL.

The act for this canal was obtained 34 Geo. III. It unites with the Coventry canal at Marston Bridge, two miles from Nuneaton ; it then passes Hinckley ; then to Stoke Golding, Dadlington, through Bosworth-Field, and near Market Bosworth ; then crosses the river Sence to Gopsal-Park, goes to Snareton, and through a tunnel it goes to Measham, Oakthorpe, and across Ashby Woulds, and through Blackfordby to Ashby-de-la-Zouch, in Leicestershire, and continues on about  $1\frac{1}{4}$  mile farther than the town, and through a tunnel of one mile, a cut is made to



Ticknall: another cut goes to the lime-works at Cloud's-Hill; on the branch to Ticknall, and near where it begins, a cut is made to Staunton lime-works, and another cut goes to Swadlincote colliery. This canal with all its branches is 50 miles long, and 252 feet lockage. To particularize which from its beginning to Oakthorpe fire engine on Ashby Woulds is  $26\frac{1}{4}$  miles, and level; thence across the Woulds 4 miles 1 furlong, with 140 feet rise; thence to Old Park beyond Ashby-de-la-Zouch is 4 miles 5 furlongs, and 84 feet fall in the last mile; the cut to Ticknall 4 miles 5 furlongs, and level; the cut to Staunton lime-works is 7 furlongs, and 28 feet fall; the cut to Cloud Hill 6 miles 6 furlongs, and level; that to Swadlingcote coal-works is 2 miles 1 furlong, and level. The level from Ashby Woulds is uninterrupted along the Coventry canal to Hill Morton on the Oxford canal, full 70 miles, without lock, rise, or fall.

This company have the usual powers; the breadth of canal, &c. 24 yards, and not to deviate at all from the line laid down without leave of the adjoining land owners.

The water is to be preserved entire at Mr. Cuzzon's at Gopsal Park, under a penalty of 50,000*l.* and if Earl Ferrers requires, the company may make a cut to Stanton Harold; the water of several springs is prohibited.

Wharfs for the use of the public will be made on Ashby Woulds, and at Green Hills, near Sutton Cheney. The cuts to Ticknall and Cloud Hill to be finished in 5 years; soil, &c. to be levelled by the company. The owners of steam engines are to supply the canal with water. The towing-path to

be used as a bridle way. The sides of the canal are to be puddled where wanting. Melborne brook to be so deepened as to be able to carry off the flood-water into the Trent.

The company are empowered to raise 150,000*l.* in shares of 100*l.* each, as usual, and liberty to raise 50,000*l.* more if wanted.

There are certain stipulations agreed to with Sir George Beaumont relative to his collieries at Coleorton, and the company are to buy coals there on certain conditions.

It being conceived that this canal will injure the Coventry canal, it is agreed that this company shall pay to that company 5*d.* per ton for all coals, goods, wares, and merchandise, carried into or out of this canal from the Coventry, Oxford, or Grand Junction canals; and if a junction with this canal and the Oxford, or Grand Junction canals, the same dues shall then be paid to the Coventry canal; and the tolls for navigating on the Coventry canal shall be calculated from Griff, where the junction was intended, it being 3 furlongs more distant than Marston-bridge. It is also specified that this canal shall be level from Ashby Woulds to its junction with the Coventry canal.

*Exemption.* The 5*d.* per ton on the Coventry canal does not extend to corn or other grain; sheep or other cattle; iron-stone or wrought iron, got or made on the banks of this canal; all kinds of manure, and materials for repairing roads.

The company also bind themselves to indemnify the Leicester navigation for maintaining the railways and water levels between the river Soar navigation and the several coal-works at Swannington,

Colenton, and Thringston common, and allow them to take for their own use half-a-crown a ton on all coals carried from any works now open or to be opened in the before-mentioned three parishes, which may pass a specified place in the lordship of Blackfordby, about 3 miles from Ashby-de-la-Zouch.

The large collieries in the north part of this canal will be vastly increased on this canal's completion.

#### BIRMINGHAM CANAL EXTENSION.

This act was granted 34 Geo. III. and empowers this new company to join, and to change the name of the old company of Birmingham, and Birmingham and Fazeley canal company, to the Birmingham Canal Navigation Company, with the usual powers for making canals, and includes all grants of former acts, and to make a cut to extend this canal from Broadwater to Walsal, and likewise to make three cuts from the same, viz. one from the canal at Broadwater to the township of Bradley, in Wolverhampton parish, another from the canal to the township of Bilstone, and another from the canal to finish near David's-Ram-Farm; and when they may think proper to make another branch from the Birmingham and Fazeley canal at Bloomfield in Tipton parish, to join the same canal at Deepfield in the parish of Sedgeley: this being chiefly to save 4 miles by making a tunnel to avoid the large elbow which is here made by the canal. To take no water from Rye-Croft, Black Brook, Cole-Pool, Gornscott, Fistley, Brown's-Hills, Clayanger, Catshill, Piddock's-Well, Little-Heath, Linley, Hay-head, and Longwood, or from any waters, springs, &c. that have generally supplied the mills and other works of the Earl of

Montrath, Lord Dudley, or J. C. Jervoise, Esq. The cut from Broadwater to Walsal is engaged to be finished within 3 years.

This company are empowered to borrow 45,000 *l.* on the credit of tolls, &c. Then follow several calculations and regulations of wharfage, tonnage, rates, &c. that will rather tend to perplex than explain, except to persons concerned or on the spot; but are unentertaining and useless to the generality of readers. By a clause in the act, a treasurer is to be chosen to receive and be answerable to the proprietors of the united companies for what money is collected at Farmer's-bridge.

#### HUDDERSFIELD CANAL.

This act was obtained 34 Geo. III. The canal joins Sir John Ramsden's canal on the side of Huddersfield in Yorkshire, and runs west parallel with the river Colne, which it twice crosses, and passes by Longwood, Staighthwaite, and Marsden. There is a tunnel of near  $3\frac{1}{4}$  miles long, from Marsden under Pule Moss and Brunn-Top, to within two miles of Dub-Cross; passing which it runs on the side of the river Tame, and crossing the windings of that river several times, comes within a mile of Lydgate, by Mossley and Stayley Bridge, and unites with the Ashton and Oldham canal on the side of the town of Ashton-under-Line, in Lancashire; pursuing a line of 19 miles 5 furlongs, and 770 feet lockage; that is to say, from Huddersfield to Marsden  $7\frac{1}{4}$  miles, and 436 feet rise; thence and through the tunnel is 3 miles 7 furlongs, level; thence to where it joins the Ashton and Oldham canal 8 miles 3 furlongs, and 334 feet fall. The summit receives and

supplies water from the reservoirs at Marsden and at the west end of the tunnel.

The company have the usual powers. The canal with towing-path, &c. is 30 yards wide ; and not to wander more than 100 yards from the line laid down. The company are enabled to make reservoirs to hold 20,000 locks full of water, each lock containing 180 cubic yards ; and other reservoirs may be made at proper places, if the first will not sufficiently supply the canal ; from those springs that supply mills the flood water only is to be taken, and the water of the reservoir is to be passed into brooks to assist the mills, which are not to be injured, but assisted. A lock of 8 feet wide is to be made where the canal joins Sir John Ramsden's canal. Sir John Ramsden is not to take any rates for goods, &c. carried out of this canal into his canal, between this canal and Sir John's warehouses near Huddersfield ; and no boat is to be navigated from this canal lower than the Red-Doles lock, on Sir John's canal, without leave ; and if Sir John Ramsden's profits suffer by means of this canal, the deficiency is to be made good by this company, taking the average of 3 years produce.

The company are allowed to raise 184,000*l.* divided into 100*l.* shares, and also 90,000*l.* more if wanted. No person is to have more than 5 votes.

If a canal at any time hereafter shall be made to the east to unite with this or Sir John Ramsden's canal, that would injure the navigation of the Air and Calder, the Calder and Habbale navigation, and Sir John Ramsden's, a full recompence shall be made by this canal company.

By this canal the east and west seas will be united within 20 miles, and from the spirit and perseverance

already manifested, there can be no doubt but the finishing hand will shortly complete it, especially as the country round, as well as where this canal passes, abounds with minerals, stone, lime, and other useful commodities to the land owners, manufacturers, and the public generally.

#### HASLINGDEN CANAL.

The act for this canal was obtained 33 Geo. III. It unites the Bury and Bolton canal from Manchester on the side of the former; it then passes Walmsley, Tottington, Haslingden, Accrington, and joins the Leeds and Liverpool canal at Church, all in Lancashire. The whole length 13 miles.

The company have the usual powers, and is granted 26 yards broad for the canal, &c. and not to deviate from the line prescribed without the land owners' consent; they are also restrained from making any locks for the passing of boats, which is intended to be accomplished on this canal by rollers, racks, inclined planes, or other machinery; but after the above experiments have been made, if they are found not to answer the purpose, and that locks are absolutely necessary, the company must apply to, and obtain the consent of three-fourths of the mill-owners on some particular streams; the mills must be protected, and flood water only made use of by the canal. The company are authorised to raise 47,600*l.* divided into 100*l.* shares, and may raise 40,000*l.* more if wanted.

Exemptions, as usual, all manures for lands adjoining; and all materials, of whatever kind, for making or mending public or private roads.

This canal is another convincing proof of the opulence and sagacity of the gentlemen land-owners and manufacturers of Leeds, Liverpool, Manchester, Bury, and Bolton, by which they receive for their raw materials and manufactured goods a cheap water carriage to a market. The whole country in the vicinity of the canal, and for some miles on each side, abounds with coals, lime, limestone, and minerals of almost all descriptions.

#### KENNET AND AVON CANAL.

The act for this canal was granted 34 Geo. III. Its junction with the river Kennet is a little above Newbury, in Berkshire, and runs parallel with that river through Lord Craven's park to Kintbury, where it crosses the river Kennet twice, and goes on to Dunn Mill, through Hungerford town, and crosses the Kennet again about a mile above it, and thence goes on to Froxfield, and again crosses the Kennet river, and again below Great Bedwin, and thence goes to Crofton, which is the head of the river Kennet. It now passes through a tunnel  $2\frac{1}{4}$  miles long from Crofton to Burbage, and comes out at Brimstade, thence it proceeds by Wooton Rivers, Wilcot, Stanton Barnard, Allington, and goes between South-Horton and Bishop Cannings, to the Devizes, and thence proceeds to between Upper and Lower Foxhanger, by Bulkington, Paxcroft and Trowbridge, where it crosses the river Avon at Trowle-bridge; thence by Ladydown Farm, to Windbrook and Bradford in Wiltshire, and at Ancliff Mills it again crosses the Avon, and goes on to Winsley and Limpley Stoke, where it again crosses the Avon, and proceeds by the side of that river beyond Bathamp-

ton, where the junction of the river Avon is completed.

It is intended to cut a branch to Calne and Chippenham, Wilts, which is to proceed from the canal between Upper and Lower Foxhanger, and will pass near to Bromham, and on to Sandridge house, between Bewley-common and Laycock, to Great Lodge, from whence one cut will go to Colne and the other to Chippenham, Wilts.

The entire length of this canal from Newbury to Bath is 60 miles, with 176 feet rise, and 369 feet fall, which I shall particularise in the following manner; from the river Kennet to Hungerford nine miles, and 72 feet rise; thence to Crofton six miles, and 104 feet rise. The level summit from here to the Devises is 20 miles; thence to Bulkington  $3\frac{1}{4}$  miles, and 271 feet fall; thence to Paxcroft five miles, and level; thence to Trowle Bridge three miles, and  $35\frac{1}{4}$  feet fall; thence to near Bathampton  $10\frac{1}{4}$  miles, and level; thence to the river three quarters of a mile, and  $56\frac{1}{4}$  feet fall. The length of the cuts to Calne and Chippenham is 14 miles five furlongs; from Chippenham to where it joins the canal at Foxhanger is  $10\frac{1}{4}$  miles, and level, and four miles one furlong from Great Lodge to Calne, with 18 feet rise in the last half mile.

Any waste water from the summit level is to be evacuated down the vale of Bedwin at Crofton, and down Horton water course, and the Bourne river to Salisbury. The company have the usual powers; and whatever may be dug out in making the canal, is to be spread on the adjoining ground at their expense. The canal is to be puddled in proper places, and the banks raised higher at Bathwick. There are several



limitations concerning the taking of land and water. Inclined planes may be used ; at the Devises a reservoir is to be made for the inhabitants. No engine of any kind or reservoir is to be made below Great Bedwin for filling the canal ; the breadth allowed is 30 yards, towing-paths included. The company are authorised to raise 420,000 *l.* to be divided into 3500 shares of 120 *l.* each, and a certain number of them to be divided in half shares ; and one whole or two half shares to have a vote ; they may raise 150,000 *l.* more if wanted. Land-owners may use boats for pleasure or husbandry 12 feet long, and five feet broad, but not for hire, nor to pass any lock. If the town of Marlbro' sustains any loss, arbitrators are to be appointed to make them satisfaction.

A canal being in agitation from Trowbridge to pass Chippenham, Wootton-Basset, and Shrivenham, and unite with the Thames at Abingdon or Wallingford ; with cuts to Calne and Chippenham : the company are not to begin those cuts for  $2\frac{1}{2}$  years from the passing the act, in order to give time to digest the other canal from Trowbridge to the Thames. The canal is to be completed in 12 years, and it is under consideration to extend it into Somersetshire, and if so, it is to be called the Somersetshire coal canal.

The utility of this canal, from its going through such a great scope of country, and through so many principal manufacturing towns, and also uniting the cities of London and Bristol, cannot but be of the greatest consequence both to the merchant and manufacturer, from the ease, cheapness, and certainty of water-carriage in a few days from one city to the other ; the long, hazardous voyage round the

Land's End, and sometimes round the Scilly Islands, may now be entirely avoided, and the ships, as well as the horses for land-carriage may be used for other purposes, and not only our woollen goods, but all other commodities will be greatly benefited by it, and it is likely, and I may say certainly, to be equally beneficial to any canal yet perfected.

Nov. 1802.—*Remarks on the progress of Canals.*

The Kennet and Avon canal is proceeding with alertness, great hopes are now formed of this undertaking, the new shares bear a premium.

#### LEEDS AND LIVERPOOL CANAL, TO VARY.

The act for allowing the variation of this canal passed 34 Geo. III. Its course and lockage have already claimed attention; and as it is not my business to enter into the opposition, objections, and interference of interested land-owners in every public undertaking of this sort, I shall merely observe that it is not now to deviate from the line laid down without the land-owners consent. The water of a number of brooks there described is not to be taken for the use of the canal. Cuts may be made by the Rev. Mr. Walton, the Earl of Balcarras, and Mr. Shuttleworth; but those are to be on a level with the canal, and to have proper stop-gates to prevent the canal losing water. A branch is also to be cut by the company to the coal-works at Ighton-Hill Park, which lies between Wigan and Chorley. The width of the canal, &c. is 26 yards, and the company have the usual powers, and are empowered to borrow on security of the tolls 280,000  $\text{\textsterling}$ . but no more.

The varying the course of this canal is of great advantage to the company, as it embraces several considerable market and manufacturing towns, which will be greatly benefited by having a cheap water-carriage for their goods to Liverpool and Hull, and carrying them supplies not only from those sea-ports, but coals and other useful commodities.

**MERSEY AND IRWELL NAVIGATION, TO INCORPORATE.**

This act is of 32 Geo. III. and distinctly repeats the meaning of former acts, to authorise the proprietors to make the rivers Mersey and Irwell navigable for boats, barges, &c. from Liverpool to Hunt's Bank in Manchester, Lancashire, and admit of particular rates of tonnage for the same. The towns of Lancashire being greatly increased in trade and manufactures; the navigation on those rivers is in consequence much enlarged. The proprietors, being by this act incorporated into a company called the Irwell and Mersey navigation company, have the full powers usual on those occasions invested in them.

**MONTGOMERY CANAL.**

Although it is my intention to arrange the canals in their proper and several countries, yet, notwithstanding the name, as this rises in an English county, I shall introduce it here.

The act for this canal was obtained 34 Geo. III. and begins at Portyvain lime-works, near Llan-y-blodwell, in Shropshire, where it unites with a cut of the Ellesmere canal; thence it goes to very near Llanymynach, and there crosses the Verniew river, where it joins another cut of the Ellesmere canal;

and then goes by Gwern-felû, where there is a cut to Guilsfield and Welch Pool; and from thence it goes parallel with the Severn, passes Berriew and Garth mill to the Severn at Newtown in Montgomeryshire. This canal is 27 miles long besides the cuts, and the lockage is 225 feet. The cut to Guilsfield is  $3\frac{1}{4}$  miles, and level. This canal joining the Ellesmere canal, affords a ready conveyance to Shrewsbury and Chester; and should the intended canal from Newtown by Ludlow be made with a junction to the Leominster canal, it will open a communication highly advantageous to the south parts of the river Severn.

The company have the customary powers; the breadth allowed is 24 yards, and not to deviate above 100 yards from the line laid down. Lledan, Country-house, nor Llivior Brooks are to have any water taken from them, unless for puddling the canal. The company are empowered to raise 72,000 *l.* in 100 *l.* shares, and may raise 20,000 *l.* more if wanted. The exemptions as usual, all manures for land, and all materials for making or mending roads.

Quarries of lime-stone, free-stone, slate, &c. as well as mines of coal, lead, and other minerals, are found on the borders of this canal its whole length, which will find a ready and cheap conveyance to a certain market, to the great emolument of the owners as well as to the consumers and manufacturers.

#### RIVER NEN NAVIGATION, TO AMEND.

An act was in the session of 34 Geo. III. granted for bettering the navigation of the Nen river, between Thrapston and Peterborough. A number of

new clauses in this act are to explain and amend the former one, and nine commissioners are elected, who are to appoint an overseer or surveyor of the works, by whose direction only they are to be executed.

#### OXFORD CANAL, TO AMEND.

This act was also obtained 34 Geo. III. to grant further powers and remedy the defects in former acts; it also increases the commissioners' qualifications to fix a price for goods under a quarter of a ton; a list of the prices is to be printed and fixed up at their wharfs. The clauses also of a former act are repealed relative to making four and in some cases five per cent. dividend, till the interest of the money borrowed be paid.

Nov. 1802. *Remarks on the Progress of Canals.*

The Oxford canal dividend is 11 *l.* the shares 275 *l.* a rising concern.

#### PEAK FOREST CANAL.

This is another act obtained 34 Geo. III. This canal forms a junction of the Ashton and Oldham canal, at Ashton-under-Lyne, in Cheshire; then crossing the Tame river passes Denton, Chad-Kirk, Maple-Chapel, Disley, to Whaley Bridge; from thence to Chapel-in-le-Frith a rail-way goes to Load's Knowl in the Peak Forest, in Derbyshire; from Chad-Kirk the canal goes parallel with the river Goyf, and is 15 miles long, and 6 miles the rail-way.

The company have the usual powers; the canal, &c. 24 yards broad, and 100 yards are allowed for deviation. Flood-water only to be had from the

rivers in its course, but may take and use waters from mines. 90,000*l.* are allowed to be raised and divided into 100*l.* shares, and no one person to have more than 5 votes; 60,000*l.* more may be raised if wanted.

Manchester, Ashton, Stockport, and several other towns and villages will feel the benefit of this canal, in getting the Peak Forest lime, coals, &c. &c. at a cheap and easy rate, as also other articles for the manufacturer.

Nov. 1802. *Remarks on the Progress of Canals.*

The Peak Forest canal bears a premium of 10*l.*

#### ROCHDALE CANAL.

This act was also obtained 34 Geo. III. The canal unites with the Calder navigation at Sowerby, Bridge Wharf at Halifax, Yorkshire, and proceeds along the side of that river to Hebden Bridge, and to Todmarden; it then goes through a tunnel  $1\frac{1}{2}$  mile to Littleborough, Rochdale, Middleton, Failsworth, and through Manchester to Castlefield, where it unites with the Duke of Bridgewater's navigation. A cut of half a mile goes to Rochdale; and from Failsworth to Hollingwood Chapel is another cut of little more than half a mile.

This canal is  $31\frac{1}{4}$  miles long, with 613 feet lockage, that is to say, from where it joins the Calder river to Hebden Bridge  $5\frac{1}{4}$  miles, and 75 feet rise; thence to Todmarden 4 miles, and 96 feet rise; then to Travis Mill  $1\frac{1}{4}$  mile, and 104 feet rise; then to Cleg-Hall  $5\frac{1}{4}$  miles the summit, and level; thence to Lower Place near Rochdale two miles, and 62 feet fall; then to Chaderton Brook, by Middleton,  $4\frac{1}{4}$  miles, and

120 feet fall ; then to Failsworth  $2\frac{1}{4}$  miles, level : thence to Manchester  $4\frac{1}{4}$  miles, and 81 feet fall ; then to the junction of the Duke of Bridgewater's canal 1 mile, and  $75\frac{1}{4}$  feet fall. The two cuts level.

The company have the usual powers ; and are to indemnify the Duke of Bridgewater for the losses he may sustain in his wharfs, &c. at Castle-hill ; his Grace is allowed certain tolls herein specified. The locks on this canal are to be of the same length and breadth as the Duke's on his canal. There are also restrictions for protecting the mills on the Irwell, Roach, and Irk rivers. The canal, &c. to be 30 yards broad, except at Slack's Brook, and there only 8 yards, and not to deviate more than 50 yards from the line. Inclined planes may be used, and reservoirs are to be at the end of the tunnel.

Branches may be made, and rail-ways to join the canal for the convenience of mines or coal-works that may hereafter be found.

The Ashton and Oldham canal may join this canal at Piccadilly in the town of Manchester, so that the waters of both are on a level ; all the overplus water is to be turned into the Duke's tunnel at Bank Top. The company are empowered to raise 291,900*l.* divided into 100*l.* shares, and may raise 100,000*l.* more if wanted, either by new shares or mortgage. Manure for land, and materials for making or mending roads are exempt ; as also all materials for building or repairing any mills on the before mentioned rivers, Steam engines within 20 yards of the canal may have a supply of water from it, and return the overplus. Boats of 15 tons, or less, must pay for that quantity on passing the locks.

Halifax and Manchester must be particularly benefited by this canal, as coals, and all kinds of minerals, are abundantly plentiful in its whole course, of which those great manufacturing towns know full well how to avail themselves; by this and the Duke's canal to Liverpool, the Grand Trunk and Grand Junction canals, will be taken cloths and other innumerable articles to Hull, London, and Bristol, and from thence diffused to all parts of the globe.

#### SOMERSET COAL CANAL.

This act is another of 34 Geo. III. This canal unites with the Avon and Kennet canal at Bradford, Wilts, near Stoke Limley, and parallel with Mitford Brook to Mitford Mill, where two cuts branch off, one goes to Coombe Hay, through a tunnel  $\frac{3}{4}$  of a mile long to Dunkerton, Camerton, and High Littleton, being 8 miles. From Mitford Mill it rises 138 feet; the other cut goes by Wellow, Foxcote, Writhlington, and proceeds about a mile past Radstock to the collieries at Welton, in Somersetshire,  $7\frac{1}{4}$  miles, and 138 feet rise. Several rail-ways are made to this canal.

The company have the accustomed powers, and are not compelled to make rail-ways unless the land owners give security to such quantities of coals, as by the tonnage will produce sufficient interest for the cost. Thirty yards broad allowed for canal, towing-path, &c. and only 100 yards to deviate from the line. Mr. Stephens's works, as well as others, are not to be molested, and the canal is to be on a level with the Kennet and Avon canal. The company are authorised to raise 80,000*l.* divided into 100*l.* shares, and 40,000*l.* more if necessary.



They are compelled to deduct 5 per cent. on their profits until it raises a bank of 1000*l.* and then to purchase government securities to that amount, to answer all demands whatever; when it is reduced to 500*l.* the 5 per cent. shall go on again, and when the profits shall be 10 per cent. the tonnage on coals shall be lowered 2*d.* per ton per mile.

Boats for pleasure and husbandry are allowed, for land owners, not exceeding 12 feet long and 5 feet wide.

By this canal Bath and Bristol will receive a constant supply of coal from the coal-works the cuts are made to, as well as the inhabitants of other towns and large villages where it is much wanted.

#### RIVER TRENT, TO AMEND.

This act was granted 34 Geo. III. for the improvement of the Trent navigation, and authorises the company to make a cut or branch from the confluence of the Grand Trunk canal and the Derwent river, to cross the Erewash canal and river; then pass Beeston, where there is a lock which forms a junction with the Nottingham canal at that town, and enters the Trent at Trent Bridge. This cut is 10 miles long, and falls 28 feet; 21 shoals and 2 bridges are avoided in the river Trent in this short length, which is 13 miles by the river.

The canal with towing-path, &c. is 20 yards broad. The contents of former acts are enlarged in this; the company are so to improve the river as always to have 2 feet 6 inches of water, that barges of 40 tons may not be impeded in the navigation. The capstern and machine at Nottingham are to be

bought by this company for 500*l.* and the fishery in the river not to be molested.

The sum of 13,000*l.* may be raised by the company, to be divided into 50*l.* shares, and they may borrow on the credit of the tolls 10,000*l.* more if wanted. No rates or tolls are to be collected till the whole 13,000*l.* is laid out and expended as mentioned in the act. The profits of this cut are never to rise above 7 per cent.

The sagacity and penetration of my old, esteemed, and much respected master, Mr. Brindley, is evidently in this canal in favour of his reply in the House of Commons, that rivers were made to supply canals.

#### WYBRLEY AND ESSINGTON CANAL, EXTENSION.

This act was another granted in the session of 34 Geo. III. (and before mentioned when treating of the former canal of this name), to extend this canal so as to unite the Coventry canal at Huddlesford near Litchfield; and, added to our first account, I have to mention, that from Birchill to Walsal, this goes up to the coal-works at Lord's Hay near Wyerley; it then passes Pelsall Wood by Brown's Hills, and over Cannock Heath to Litchfield, and joins the Coventry canal opposite Huddlesford. At Cannock Heath a cut is made to go by Walsal Wood, to Hay Head lime works. This canal and the branches are  $34\frac{1}{2}$  miles long, and 264 feet fall from Cannock Heath to the Coventry canal.

From Wolverhampton to Birchill is  $7\frac{1}{2}$  miles, and level; from thence to lock 1, on Cannock Heath, 8 miles, level; and thence to the union  $7\frac{1}{2}$  miles. The cut to Wyerley Bank  $3\frac{1}{2}$  miles, and that to

Lord's Hay at Wyerley  $2\frac{1}{4}$  miles; that to Hay Head lime works  $5\frac{1}{4}$  miles, and all level. There is likewise a cut of the collieries in Ashmore Park. The other branches formerly mentioned are relinquished.

The company have the usual powers, and they are to take no water from the Birmingham or Staffordshire canal; they are empowered to raise 75,000*l.* and 40,000*l.* more if wanted, divided into 100*l.* shares; and they are also compelled to buy the first company's shares that may not be satisfied with this extended act, the conduit pipes at Litchfield are not to be damaged under a heavy penalty.

The produce of the coal and other valuable mines of the Marquis of Stafford, Mr. Vernon, Mr. Anson, and Mr. Pulteney will now find a way to market. The canal being chiefly cut through commons and waste land, the surface was but of little value; but nature generally has so ordered it, that where the surface is barren or mountainous, the bowels of the earth make ample amends.

#### WISBECH CANAL.

This act was obtained 34 Geo. III. and intends this canal to have a straight cut to join the Wisbech river at the Old Sluice in the aforesaid town, pass Elm, and at Outwell join Well Creek, and the old river Nen, at Outwell, in Norfolk; it is about 6 miles long.

The company have the customary powers, and to be served with water from Wisbech river; but not to deviate more than 100 yards without consent; 20 yards are granted for the width of canal, towing-path, &c. The old cottages by the side of the old river are to be removed, and rebuilt near Wisbech by the company; and the Bishop

of Ely is empowered to grant them lands out of the wastes of Wisbech and Barton.

The company may raise 14,000*l.* divided into shares of 105*l.* each ; and may raise 6,000*l.* more if wanted. Officers and soldiers, their horses, arms, and baggage, and timber, or other stores for his Majesty's service, are exempt from any toll or rate ; as are also all manures for lands, and materials for making or mending any public road ; also all materials that may be wanted for the use of the Bedford level, and husbandry boats by owners of adjoining lands, which are not to pass locks without paying.

The river Nen, from Outwell church to Salter's Load is to be made properly navigable, and all boats going into or out of this canal into the Nene or Well Creek, are to pay 3*d.* for every ton of goods ; out of which 100*l.* yearly to be paid to the commissioners of the Nene navigation, and the residue to be used for upholding the navigation between Outwell and Salter's Load sluice. Boats that have paid this toll are exempt from paying at Salter's Load or Stand Ground sluices.

#### RIVER WELLAND NAVIGATION, TO AMEND.

This act is also another of 34 Geo. III. and begins with observing that the out-falls of the river Welland are defective, and appoints three commissioners to carry it into execution ; they are directed to cleanse the river Welland, from the lock at Vernatt's Drain to Shepherd's Hole, in the parish of Surfleet, and to make a dam at this place across the river to stop the tide and the land floods ; and from thence to make a cut navigable at or near Hooten's Gibbet,

across the salt marshes to Wyberton roads, by the Ship alehouse, near Boston, Lincolnshire.

The new cut beginning at Hooten's Gibbet not to be less than 4 feet below the pointings of the present sluice, at the out-fall at Vernatt's Drain, and to be continued on an inclined plane of 4 inches in a mile to the end. The new cut to be 50 feet wide at bottom, with a batter two feet on each side for every foot deep; the forelands on the north side to be 30 feet in width, and on the opposite side 50 feet; the south bank to be 60 feet at its base, and 30 feet wide at its top, and not less than 11 feet high; the north bank must be 10 feet at the base, and 6 feet at the top, and the same height. A new sea sluice is likewise to be made with gates pointing both to land and sea, the mud sill whereof to be laid 1 foot under low water mark at Wyberton roads; the clear water way must be 50 feet. A lock is to be made by the side of this sluice 60 feet long and 8 feet wide, fit for the boats, barges, &c. that navigate thereon. Directions for the river adjoining are also comprised in this act, tending principally to draining the adjoining lands, of which they stand greatly in need. For this purpose the commissioners are authorised to levy taxes, and borrow money on the security thereof to complete the work.

A new bridge is to be built over the canal at Fosdyke Inn; and the road over Fosdyke-wash is to be rendered safe and useful to passengers and cattle in all seasons and all tides, for which accommodation fixed tolls, &c. are expressed in the act; as are also several useful regulations between the commissioners and land owners, as also their tenants, for the mutual benefit of all parties.

**WARWICK AND BRAUNSTON CANAL.**

This act was obtained 34 Geo. III. for making this canal to unite with the Warwick and Birmingham canal, in the parish of Bredbrook, in the town of Warwick, where it crosses the river Avon and passes Radford, Offchurch, Long Itchington, and there crosses the Watergall river, by Lemington, Hastings, Granborough, and there crosses the river Leame, then to Braunston, and joins the Oxford canal after running a course of 20 miles.

The company are allowed the usual powers. The canal, towing-path, &c. are to be 30 yards wide, but not to deviate from the line without consent. Where it joins the Warwick canal it must be level, and any waste water of the last mentioned canal may be used by the other. The rivers Avon and Leame, Saltisford Brook, Myton Brook, or Priory-Mill-Pools, are not to have any water taken from them.

The company are empowered to raise 100,000*l.* to be divided into 100*l.* shares, and may raise 30,000*l.* more if wanted. No one person is allowed to have above 15 shares. Several particular tolls and rates of other canals uniting with this canal are guaranteed by this to those companies, if their rates and dues shall be reduced by means of this canal.

From Birmingham by land carriage to London is 110 miles; and by this canal, from its joining the Braunston canal, is only 142 miles, which is a short carriage by water. All the heavy goods from Birmingham, Wolverhampton, Dudley, Walsal, and the neighbouring manufactories will certainly for cheapness as well as expedition go by this canal to London.

## CANALS. 1795.

*For improving the Navigation of the river Itchin in the County of Southampton, and to explain and amend the 16 & 17 Car. II. and 7 Geo. III.*

This act for improving the river Itchin navigation, (so as to make it navigable for boats, barges, and other vessels, passed in the year 1795) which runs from Alresford through Winchester, to the sea near Southampton, directs, that a certain number of commissioners therein named, should regulate, settle, and ascertain reasonable rates and prices for the conveyance of all kinds of goods thereon; and for the more ready performance thereof, the said river is to be widened from Woodmill to the Roman Ditch, and to be made navigable and passable at all times for boats and barges to low water mark at Bittern Faren, nearly opposite to Northam Quay, and to supply the same from all springs, brooks, water-courses, &c. that may be found within 100 yards on each side of the same; and to make reservoirs if necessary; also to make aqueducts, sluices, and locks, with towing-paths on the banks and sides of the same, with warehouses, landing-places, cranes, and all other works requisite, making satisfaction to the owners of lands through which it is to pass, so as not to exceed 12 yards in breadth. Seven or more commissioners to value all lands, adjust all differences, and assess damages; the whole is vested in James D'Arcy, esq. his heirs and assigns, subject to certain specified incumbrances, and is declared to be a public act.

## NEWCASTLE-UNDER-LYNE CANAL. 1795.

This canal begins at or near Stoke-upon-Trent, Staffordshire, and goes to the town of Newcastle-under-Lyne; the preamble sets forth, that the making and maintaining a canal for the navigation of boats, barges, &c. from and out of the navigation from the Trent to the Mersey, in a piece of land called Quinton's Wood in Stoke-upon-Trent, through the village of Stoke aforesaid, between the works of Thomas Wolfe and Josiah Spode in Stoke, to the town of Newcastle-under-Lyne, and the works near thereto, will be of great utility, and will materially assist the agriculture of the neighbourhood of the said canal; and the several persons hereinafter named are desirous at their own cost and charges to make and maintain the same, but cannot without the aid of parliament.

This company is incorporated by the name of the Newcastle-under-Lyne Canal Company, and as such are empowered to make and cut a canal, which, with the towing-paths, drains, ditches, and fences, shall not exceed 26 yards in breadth, except where docks, basins, or pens of water must be made, and with power to deviate 100 yards. No water to be taken but of the river Trent, except at times of floods, between December and the first of April, nor out of the Trent and Mersey canal, nor from the spring or stream of water in the village of Stoke-upon-Trent, which supplies the engine of Thomas Wolfe, in Stoke aforesaid, nor any water from the cut or canal of Sir Nigel Bowyer Gresley, bart. No buildings to be erected on the banks or towing-paths, except for the use of the navigation; satisfaction to be made, and



parties disagreeing, to be settled by commissioners named in the bill, and elected when any one dies or refuses to act. The proprietors are empowered to raise 7,000 *l.* to be divided into 140 shares of 50 *l.* each, and to be deemed personal estate, and to have a vote for every share; but no one to have more than six votes; and in case 7,000 *l.* is not sufficient, they are empowered to raise 3,000 *l.* more, either by subscription or mortgage, but no mortgagee to have a vote. Now follow the rates of tonnage and wharfage, &c. as usual in all canal acts, and the right of making locks, dams, tunnels, reservoirs, swivel and draw-bridges, reed bridges, &c. &c. &c. And it is taken and deemed a public act.

IVELCHESTER TO LANGPORT CANAL. 1795.

This act was obtained in 1795, for improving the navigation of the river Ivel, otherwise Yeo, from the town of Ivelchester to Bicknel bridge, in the county of Somerset, and for making a navigable canal from thence into a certain drain called Portlake Rhine, in the parish of Langport in the same county, and for making the said drain navigable from thence to the river Parret, below Great Bow bridge in the town of Langport, and which will open a short and easy communication between those places and the neighbouring country, and will be productive of great public advantage, but cannot be done without the authority of parliament, which empowers a company of proprietors to make a navigable cut through the several parishes of Ivelchester, Northover, and Somerton, Hamlet of Sock Dennis, the parish of Tintinhull, the Hamlets or Tythings of Milton Widcomb, Longload, and Bowerhinton, all in the parish of

Martock, the parishes of Long Sutton and Muchelney, and of Huish-Episcopi, Langport, and Curry Rivell, all in the county of Somerset, to alter the banks of the river and cut through adjoining lands, to remove all obstructions, make locks and bridges, erect toll houses, make towing-paths, and basins for boats to lie or pass each other; and stones to be erected on the sides of the canal at every half mile; and the company to raise 6,000 *l.* to complete the said canal, and to be divided into shares at 50 *l.* a share, and to be personal property, and may raise 2,000 *l.* more if the first sum is inadequate; and every share to have a vote or by proxy, but not for more than 10 shares; and it is taken and deemed a public act, having the usual clauses and penalties of all navigation acts.

N. B. The width of the canal, banks, and towing-paths is omitted in the act.

GRAND JUNCTION CANAL TO VARY, IN THE  
COUNTY OF HERTFORD, 1795.

The preamble recites 33 Geo. III. cap. 80, by which certain persons are incorporated by the style of the Company of Proprietors of the Grand Junction Canal, with power to make a canal from the Oxford canal at Braunston, to join the Thames at Brentford, in such line as is described by certain plans and books of reference therein mentioned; and states that great progress is made in the work, and that if the company were allowed to deviate from the line of a certain part of the canal, the high grounds in the parish of Abbot's Langley might be avoided, and a tunnel there rendered unnecessary; it is therefore enacted to repeal the deviation of the line of the

canal more than 100 yards, without the consent of the land owners, within the parishes of Abbot's Langley, King's Langley, Watford and Rickmansworth, in Hertfordshire, and permit the company to deviate according to a new plan deposited at the office of the clerk of the peace for Hertfordshire, in Sept. 1794.

By this new plan the canal and its works may be made through the pleasure grounds of the Earl of Clarendon and the Earl of Essex, and any other lands in the said parishes.

The towing-paths to be made within Grove Park, and the pleasure grounds of the Earl of Clarendon shall be carried on the east side of the canal, and not exceed six feet in breadth without his consent. No warehouses or other buildings shall be erected in the Earl's pleasure grounds, nor any locks nor sluices without his consent; and the two ponds in the grove gardens, and the engine pond shall be kept full of water from the canal, and which shall be kept on a level with the water in the river; and after the canal is completed through such pleasure grounds, the company shall make compensation to the Earl of Clarendon for all damages occasioned by the canal, and they shall keep it clean and neat and in good repair; and the right of fishery in the canal through the Earl's lands shall belong to him; and no barge, boat, or vessel shall stop within the park, unless by accident, or land or take on board goods and passengers to the Earl or his family, under forfeiture of five pounds to the Earl.

The same clause is inserted to take place in the grounds of the Earl of Essex, or Sir John Filmer, as of the Earl of Clarendon, and if their fisheries

shall be injured, or those of Thomas Marriot, esq. the company to make it good ; as also the mills of Thomas Tovey of King's Langley, or William Smith of Abbot's Langley ; and proper watering places to be left for cattle on the whole line of the navigation, and also to supply the fish ponds. The powers by this recited act vested in the general committee, or any nine of its members, may now be exercised by the majority of the members present at any meeting, being not less than seven. The company was restrained from conveying coal, culm, or cinders on the canal, nearer to London than the mouth of the tunnel to be made at Langley Bury ; and in consequence of the deviation no such tunnel will now be made ; it is therefore now enacted, that no coal, culm, or cinders, (except such as are carried and used at the houses of the Earls of Clarendon and Essex) shall be carried nearer to London than a stone or post to be affixed within six months after passing the act, at the north-west end of Grove Park, under forfeiture of the barge or vessel, and also 50 £. And this act is taken and deemed a public act.

GRAND JUNCTION CANAL FROM NORWOOD TO  
PADDINGTON. 1795.

The preamble recites 33 Geo. III. cap. 80, for making a navigable canal from the Oxford canal navigation at Braunston in the county of Northampton, to join the river Thames at Brentford in the county of Middlesex, and also certain collateral cuts from the said intended canal, whereby several persons are made a body politic and corporate, by the style of The Company of Proprietors of the Grand Junction Canal, and states, that certain acts were passed in

the last and present session of parliament for making other navigable cuts to communicate with the Grand Junction navigation; and as, by surveys lately taken, it appears that a navigable cut may be made from the Grand Junction canal in the precinct of Norwood, in the county of Middlesex, to Paddington in the same county, which cut will open a cheap and easy conveyance as well for passengers as for supplying provisions to the populous parishes of St. Marylebone, Paddington, and the western and north-western parts of the metropolis, from the counties of Middlesex, Bucks, Hertford, Northampton, and Leicester, and also a direct communication for the carriage of all manufactured articles from the several manufacturing towns in the north, north-east, and north-west parts of the kingdom; and will supply at a reduced price, lime and other manure to the lands upon the line of the intended cut, and will be of public utility: It is therefore enacted, that the said company may make a navigable cut from the Grand Junction canal through Norwood aforesaid, in the parish of Hayes, Yeading in the said parish, Northolt, Greenford, Perrivale, Apperton in the parish of Harrow Twyford, Willesden, Acton, Hammersmith, Kensington, and St. Luke's, Chelsea, in the county of Middlesex, to Paddington; and a towing-path on each side, and do all works requisite for making the navigation thereof, (it then recites the former acts). The cut shall not be of greater width at the surface of the water than 20 yards, except where docks or basins shall be made, or were necessary for vessels to lie or pass each other, nor more than 45 yards at any place; and the towing-paths, ditches, and fences, not to exceed 12 yards

in breadth, except where warehouses, cranes, or weigh-beams may be erected, or wharfs for reception of goods conveyed on the cut. The plan describing the line of the intended cut, and the lands through which the same is to be carried, with a book of reference, containing a list of the names of the owners of such land, is deposited with the clerk of the peace for Middlesex.

The company shall not carry the cut into certain lands now belonging to Thomas Wood, esq. Sir John Morshead, bart. and Elizabeth his wife, and Robert Thistlethwayte, esq. and Selina his wife, as lessees of the see of London, situate between a small inclosure of William Godfrey, esq. at Westbourne Green, in the parish of Paddington, and the Edgware Turnpike Road, or through any other lands their property as lessees aforesaid, (except one field called Upper Readings, at Westbourne Green) without the consent of the land-owners and of the Bishop of London.

No soil shall be dug by the company on North-Hyde-Heath, in the parishes of Heston and Cranford, and the district of Norwood, for making bricks for their use.

The company are empowered to build and keep in repair brick arched bridges, and reduce and raise the rates, but not exceeding the sums mentioned, and are entitled to receive additional rates for any goods which may remain on any wharf or quay belonging to them above three hours; and no vessel under 20 tons burthen, nor any vessel used for carrying passengers, or any other persons not employed in navigating it, shall be used on the cut without the consent of the company, upon pain of forfeiting 10 £.

The tonnage of goods conveyed on this canal as follows : for all lime and ashes passing westward upon the cut to be used for manure, and for all other manure so passing, one penny per ton per mile.

For all separate parcels, and other articles not exceeding 2cwt. each, and belonging and consigned to different persons, one halfpenny per mile ; and for all other things whatsoever three halfpence per ton per mile. And this shall be deemed a public act.

**WORSLEY TO PENNINGTON CANAL. 1795.**

The preamble states, that by virtue of three acts of 32 & 33 Geo. II. and 2 Geo. III. the Duke of Bridgewater hath completed a navigation from or near Worsley mill, and Middlewood in the manor of Worsley, in the county of Lancaster, over the river Irwell to the town of Manchester, and also from Langford bridge to the river Mersey in the county of Chester ; and as, by a survey lately taken, it appears that a navigable cut may be made from the said canal at Worsley to or near the town of Leigh in the said county, which would be of great benefit to all persons residing or having estates near the line of such cut, and of public utility ; and as the Duke, being Lord of the manor of Worsley, and proprietor of the said navigation, is desirous at his own expense to make and maintain such navigable cut : It is enacted, that he may make it from the present canal at Worsley to the township of Pennington near the said town of Leigh, and may do all things thereto requisite for maintaining and supplying it with water, and making wharfs, quays, landing places, weigh-beams, warehouses, bridges, and other works ; and in order thereto the Duke, his agents

and servants, and all other persons, commissioners, bodies politic, &c. shall be invested with the like authorities, and shall be subject to the like rules, payments, penalties, and punishments as are mentioned in the recited acts; and the Duke is allowed to demand for tonnage and wharfage 2s. 6d. per ton, and may seize the vessel and goods for payment, and if not redeemed in five days may be appraised and sold. And this shall be deemed a public act.

**SOUTHAMPTON AND SALISBURY CANAL. 1795.**

The preamble states, that the making a navigable canal from the town of Southampton through the several parishes of Holy Rood, St. Lawrence, All Saints, and St. Mary, within the said town and liberties, and the parishes of Hill, otherwise Four Posts, Milbrooke, and Red-bridge, to join the Andover canal at or near Red-bridge, in the county of Southampton, and to go out of the Andover canal at or near Kimbridge Mill in the parish of Mitchelmarsh in the said county, and through the several parishes of Mitchelmarsh, Mottisfont, Lockerly, East Dean, West Dean, East Grimstead, West Grimstead, Alderbury, Peter's Finger, Laverstock, Milford, and the parish of St. Martin in the city of New Sarum in the county of Wilts, and also a cut or branch out of the said canal at the town of Southampton to the Winchester navigation at Northam, in the parish of St. Mary, within the liberties of the said town, to communicate with the Winchester navigation in the river Itchin there, will be of great public utility: It is therefore enacted (here follows a long list of names of the company of proprietors) that they shall be incorporated by the name of the Com-



pany of Proprietors of the Southampton and Salisbury Canal; and they may make the said canal and collateral branch to Northam, in the course delineated on the plan, or within 200 yards of the same, and may supply the canal and collateral branch with water from any springs found in making them, or within 1000 yards; may make reservoirs, feeders, aqueducts, tunnels, bridges, drains, wharfs, quays, warehouses, landing places, roads, and conveniences where requisite; particularly one public wharf, quay, and landing-place in Southampton, Northam, and New Sarum, or near thereto, making satisfaction for damages. The company shall not alter the present course of the Andover canal, or take water therefrom; but they shall erect and maintain flood-gates in their canal to regulate the height of water, and to prevent taking water from the Andover canal, and not exercise their powers in any garden, orchard, yard, paddock, park, avenue, or planted walk to any mansion-house without the consent of the owner.

The lands to be used for the canal, collateral branch, towing-paths, &c. shall not exceed 30 yards in breadth, nor exceed 100 yards in breadth where it is necessary for vessels to lie or pass each other, or for basin, wharf or crane. The company shall puddle, where necessary, the sides of the canal through all the lands, to prevent, as much as possible, the water oozing through the sides.

The company are empowered to raise among themselves 56,000*l.* to be divided into shares of 100*l.* each, and no proprietor to have above 15 shares, unless they come by will. The 560 shares are each to be personal estate; and if that sum shall not be suf-

may raise a further sum of 30,000*l.* in 100*l.* shares as before, but no one person to have above 10 shares, and half to be raised by the first subscribers, and the other half by borrowing on mortgage at interest, on the credit of the navigation; every share to have a vote personally or by proxy. The canal and collateral branch shall be measured, and stones erected on the sides thereof at every quarter of a mile distance. It is taken and deemed a public act, there being all the usual formalities and descriptions as in all other navigation acts, not worthy repeating.

There is also a schedule containing the intended width of the canal where deep cutting occurs in 16 different depths, regulated according to the act, from 5 feet to 35 feet in depth, and from 45 feet to 140 feet wide.

#### WILTS AND BERKS CANAL.

The preamble states, that the making of a canal from the river Thames or Isis at Abingdon, in Berkshire, to join the canal now making from the river Kennet to the river Avon at Trowbridge in Wiltshire, and also several cuts hereinafter mentioned, will greatly facilitate and render less expensive the conveyance of all kinds of commodities not only to and from several towns and places near the line of the canal and cuts, but also to and from the ports of London and Bristol, and will be of great public utility; It is therefore enacted (then follows a long list of the names of the company) that they shall be a body politic and corporate, by the name of the Company of Proprietors of the Wilts and Berks Canal Navigation, and they may make and keep

navigable a canal from the river Thames or Isis, at or near the town of Abingdon, in Berkshire, through the towns of Wantage, Swindon, Wootton Bassett, Chippenham, and Melksham, to join the canal now making from the river Kennet to the river Avon at Trowbridge, in Wiltshire, and also a navigable cut from the first mentioned canal, in Breach Field, in the parish of Wantage, in Berkshire, to the town of Wantage, and also another cut from the same canal in the Plough'd Field, in the parish of Brimhill, in Wiltshire, to Colne; and also another cut from the same canal in a close of ground in the parish of Chippenham, in Wiltshire, called the Little Middle Ground, to the town of Chippenham; and to supply the canal with water from all springs found in making the same, and from all rivers and water courses within 2000 yards thereof; and may make reservoirs, aqueducts, tunnels, bridges, steam-engines, weirs and other machines for such supply of water; also may erect toll-houses, warehouses, weighing-beams, cranes, fire-engines, make ways and conveniences as they shall think requisite, and may also take any soil or stone for the use of building, &c. within the same distance, by paying the owners.

If the company shall deem it expedient that vessels should be conveyed along any part of the line by rollers, inclined planes, or in any other manner than by means of locks or sluices, they may cause the same to be done. The lands to be used for the canal shall not exceed 30 yards in breadth, except in such places where any dock or reservoir shall be made, or where the canal and cuts shall be raised higher or cut more than 6 feet deeper than the present surface, and except in such places where vessels

may lie or pass each other, or where any warehouse, wharf, or weighing beam shall be erected; nor more than 100 yards broad at any place, and no road bridge should exceed 3 inches perpendicular to one yard horizontal. The company may raise among themselves 111,900*l.* in shares of 100*l.* each, and no person shall be possessed of more than 50 shares, except the same shall come by will or law, on pain of forfeiting all shares exceeding 50 to the company, and the 1,119 shares shall be numbered numerically; and if that sum shall be found insufficient, they may raise 150,000*l.* more by subscription or mortgage, and the interest paid half-yearly. The canal to have stones or posts marked on the sides or banks at every half mile. This is deemed a public act.

N. B. A most unusual number of clauses are inserted in this bill to guard private property, and all the usual clauses in navigation acts.

STRATFORD-UPON-AVON CANAL INTO THE  
WARWICK AND BIRMINGHAM. -

The preamble recites act 33 Geo. III. cap. 112, for making and maintaining a navigable canal from the Worcester and Birmingham canal navigation, in the parish of King's Norton, into the Borough of Stratford-upon-Avon, and also certain collateral cuts from the said canal, whereby several persons were incorporated by the name of the Company of Proprietors of the Stratford-upon-Avon Canal Navigation for making the said canal and other works; and as by surveys lately made it appears that a navigable cut may be made from the Stratford-upon-Avon canal, in the parish of Lapworth, to the Warwick and Birmingham canal, in the manor of Kingswood,

in the parish of Rowington and county of Warwick, which will be of great utility : It is enacted, That the said company may make and maintain a navigable cut accordingly, with reservoirs, bridges, and other things that shall be requisite for supplying the canal with water, as they are authorised to do by the recited act with respect to the Stratford-upon-Avon canal. A map of the line of the intended cut, with a book of reference, with the names of the land owners, is left with the clerk of the peace for the county of Warwick.

No water to be taken from the Warwick and Birmingham canal, but use may be made of all springs that may be cut through. In case the money raised by the recited act shall be insufficient, 10,000*l.* more may be raised. And this is deemed a public act.

N. B. This canal interfering with the Dudley and Worcester canal, the rates of tonnage and numerous clauses are inserted to provide against encroachments and misunderstandings that may arise in those useful undertakings ; but being so difficult as well as useless to explain here, I therefore purposely omit them, as they cannot benefit the reader unless upon the spot.

#### WATFORD TO ST. ALBANS CANAL. 1795.

The preamble states, that an act was passed 33 Geo. III. for making a canal from the Oxford canal at Braunston to join the river Thames at Brentford, in Middlesex, and by that act several persons are incorporated by the name of the Company of Proprietors of the Grand Junction Canal for carrying it into execution, and certain acts were passed in the last and present session for making other navigable cuts to communicate with the Grand Junction navi-

gation; and that by surveys which have been made it appears, that a navigable cut may be made from the Grand Junction canal at Watford to St. Albans, which would be of great public utility: It is therefore enacted, That the said company may make a navigable cut from the collateral cut from the Grand Junction canal at Watford to the town of St. Albans, through the parishes of Watford, Bushey, Aldenham, St. Stephen, and St. Peter, and do all things requisite for completing the same; among others they must build 7 road bridges 12 feet wide, at particular places therein mentioned.

The width of the canal and towing-paths is not mentioned in the act; suppose it to be the same as other collateral cuts out of the Grand Junction canal.

The company are allowed to borrow 3000*l.* at interest; and this is deemed a public act. Great care is taken by a vast number of clauses to secure private property, tonnage, and freightage, and to pay off by instalments the money borrowed on the credit of the navigation.

#### GRAND JUNCTION CANAL, TO FINISH. 1795.

The preamble recites 33 Geo. III. cap. 80, whereby certain persons and their successors were incorporated by the style of the Company of Proprietors of the Grand Junction Canal, and authorised to make a navigable canal from the Oxford canal at Braunston, in Northamptonshire, to join the river Thames at or near Brentford, in the county of Middlesex, and certain collateral cuts, and to raise money to defray the expenses thereof, not exceeding 600,000*l.* and by 34 Geo. III. cap. 24, the said company are authorised to make navigable cuts from Buckingham and Ay-

lesbury to communicate with the canal, and a cut from Wendover to its summit, in the parish of Tring and county of Hertford, for supplying the canal with water; and also an act of last session to vary the course of part of the canal in Hertfordshire; and two other acts were made, one for a cut out of the said canal at Norwood, in Middlesex, to Paddington, and the other cut from Watford to St. Albans, in Hertfordshire; and as the said company are proceeding in making the canal, and have already completed a considerable part thereof, in which they have expended a large sum of money, but find the 600,000*l.* will not be sufficient to complete the same, it is therefore enacted that the company may raise 225,000*l.* more to finish the works authorised by the said act, and if raised by subscription to be divided into 4500 half shares of 50*l.* each, which half shares shall be numbered to correspond with the numbers of the shares, and shall be deemed personal estate; and the subscribers to the half shares shall be incorporated with the company, with the qualification to vote. Two half shares shall be equal to one share, but no proprietor shall be entitled to vote for a single half share. The 225,000*l.* may be borrowed at interest, or raised by annuities, and assign the navigation and rates for security. Mile stones to be erected on the sides of the canal.

As the commissioners by the first recited act have set out 68 acres 1 rood and 22 perches of land upon Aldenham common, in the parish of Aldenham, in Hertfordshire, for a reservoir for collecting floodwaters to supply the Gadne and Colne rivers for the benefit of the mills thereon with a quantity of water equal to what will be taken therefrom for the use of

the canal; and the company are willing to pay 2051 *l.* 12*s.* 6*d.* for the absolute purchase of the land so set out. - If it shall appear that the company want a larger portion of the common, they may have not exceeding 10 acres, and paying after the rate of 30 *l.* an acre. Nothing herein shall prejudice the right of fishery the lord of the manor may be entitled unto. This is deemed a public act, and great care is taken in the clauses to guard private property, as also the profits to the proprietors by rates and tolls, &c.

THAMES AND SEVERN CANAL, TO RAISE MONEY.  
1796.

The preamble recites 23 Geo. III. cap. 38, for making and maintaining a navigable canal from the river Thames or Isis, at or near Lechlade, to join and communicate with the Stroud water canal at Walbridge, near the town of Stroud, whereby certain persons were incorporated by the name of The Company of Proprietors of the Thames and Severn Navigation, &c. with power to raise 130,000 *l.* among themselves, and if that sum should be insufficient, to borrow at interest the further sum of 60,000 *l.* upon the credit of the undertaking. And as by 31 Geo. III. cap. 67, they have borrowed that sum of 60,000 *l.* and as the company have expended not only the first sum, but also by far the greater part of the last sum; and as there will be due to the subscribers of original shares for interest to January 5, 1796, 37 *l.* 10*s.* upon each share, amounting in the whole to 48,750 *l.* and the company have incurred other debts for arrears of interest for monies borrowed in order to prosecute the undertaking, which is now



almost completed; and as the company have occasion for a larger sum of money than they are at present enabled to raise, it is enacted, that the said company may raise 65,000 *l.* more, to be applied to the uses before mentioned; which sum of 65,000 *l.* shall be divided into 1300 half shares of 50 *l.* each, and be deemed personal estate, and be incorporated with the company, and to vote, two half shares to be equal to one share, but one single half share to have no vote: and this to be deemed a public act. Great care is taken to make the public calls agreeable to the subscribers.

WARWICK AND BIRMINGHAM CANAL, TO AMEND.  
1796.

The preamble recites 33 Geo. III. cap. 38, whereby certain persons and their successors were incorporated by the style of The Company of Proprietors of the Warwick and Birmingham Canal Navigation, and authorised to make a navigable canal from or near the Saltisford, in the parish of St. Mary, in the borough of Warwick, into or near to Birmingham, to terminate at or near a navigable canal in or near Birmingham, called the Digbeth Branch of the Birmingham, and the Birmingham and Fazeley Canal, and to raise towards the expense thereof 100,000 *l.* and if that sum be not sufficient, the further sum of 30,000 *l.* but doubts have arisen whether the proprietors are compellable to raise among themselves the latter sum, and as they have already completed a great part of the canal, and expended a large sum of money, they find the aforesaid sums insufficient to finish the purposes of the act, and the act has in some respects been found

defective. It is enacted, that the clause in the recited act, which enacts that the company may contribute among themselves 30,000 *l.* shall be repealed, and instead thereof they may raise 50,000 *l.* to be applied in defraying the expense of completing the canal and works, and to be divided into 1000 half shares of 50 *l.* each, and deemed personal estate; and the subscribers shall be incorporated with the company, and have a vote for every two shares, but not for one single half share. And if the 50,000 *l.* shall not be found sufficient, the company may borrow at interest, on bond or mortgage of tolls granted by the act, a further sum of 30,000 *l.* and the interest thereof shall be paid half-yearly, in preference to any dividend to the company. By the first act it is directed, that no person shall hold above 15 shares, it is now enacted that no person holds above 25 shares, unless they come by will, and reckoning two half shares as one share: and this is deemed a public act.

N. B. Very few clauses are added, and those only regarding the transfers and priority of payment and interest, with particulars respecting the different calls and sums so called for, and how disposable, with the proper notices, &c.

KENNET AND AVON CANAL, TO AMEND. 1796.

The preamble recites 34 Geo. III. cap. 90, for making a navigable canal from the river Kennet, at or near Newbury, in the county of Berks, to the river Avon at or near the city of Bath; and also certain navigable cuts therein described, by which several persons and their successors were incorporated by the name of The Company of Proprietors of the

Kennet and Avon Canal Navigation, and states that the company have begun the canal, and are desirous to finish it, but find on examination of the country, that it will be more convenient to the public if, instead of the line directed to be pursued by the recited act, they were empowered to adopt a shorter and more direct line from a place between Upper and Lower Foxhanger, in the parish of Rowd, in Wiltshire, to near Trowbridge, where the Wilts and Berks canal was originally intended to join the Kennet and Avon canal, and to carry it from that place to near Semington, through which the Wilts and Berks canal will pass; this will save a parallel canal of three miles, and will make the Kennet and Avon canal two miles shorter, and afford a more direct passage for vessels between Chippenham, Calne, Melksham, and Devizes, and other parts eastward. It also recites 35 Geo. III. cap. 52, for making and maintaining a canal from the river Thames or Isis, at or near the town of Abingdon, in the county of Berks, to join the Kennet and Avon canal, at or near the town of Trowbridge, in the county of Wilts, and also to certain navigable cuts therein described, (now follows a long chain of alterations in the original line of the canal, to shorten the distance and diminish the expenses by numerous surveys to ascertain the certainty of making such variation. The plan and book of reference is deposited with the clerks of the peace for the counties of Wilts and Somerset, for the inspection of those concerned in this most useful navigation), by which it appears, that by varying the line and supplying the canal with water by a steam-engine, will prevent the necessity of a tunnel of upwards of two miles in

length, and will be more convenient to the public. And it also appears that the canal may be carried across the river Avon, a little below Avon Cliff Mills, in the parishes of Westwood and Bradford, at a less expense and less detriment to the mills; and also by thus varying the line a very expensive embankment and aqueduct bridge across Mitford valley and brook will be saved; and at the town of Trowbridge a basin will be made, not exceeding 120 yards in length and 60 in width; and the canal, with towing-paths, banks, drains, ditches, and fences, may be of any width not exceeding 100 yards, and shall not deviate more than 100 yards from the line of the book of reference according to the last survey. The company may make locks, bridges, wharfs, quays, engines, tunnels, aqueducts, warehouses, and all other matters or things for making and maintaining this navigable cut, as under the first-recited act.

The company shall complete and open for the navigation of vessels, the variation of the canal, from the place between Upper and Lower Foxhanger, to the now intended junction with the Wilts and Berks canal near Semington, within seven years. And from thence to the first intended junction of the two canals in Lady-down Farm, within 18 months from the passing of this act; and from thence to the junction of the Kennet and Avon canal, with the Somersetshire coal canal, with all possible dispatch; and the canal from the now intended junction near Semington, to the first intended junction in Lady-down Farm, shall be considered as part of the Kennet and Avon canal navigation; that the whole line of navigation by water from Newbury to Bath may be the

same concern only. This shall be deemed a public act.

N. B. It does not appear that the company wants to raise any more money than the first recited act enabled them to do and secure, being 150,000 *l*.

#### GRAND WESTERN CANAL. 1796.

The preamble states, that the making a navigable canal from the river Exe, near Topsham in Devonshire, to communicate with the river Tone, near Taunton in Somersetshire, will open a communication between the Severn and the British Channel, and will be of great public utility ; and if certain navigable cuts were made from the canal, it would tend greatly to improve the lands in the said counties ; it is therefore enacted, That (here follows a vast number of names of proprietors), and their successors, shall be incorporated by the name of The Company of Proprietors of the Grand Western Canal, and they may make a canal from the tideway in the channel of the river Exe, near the lower end of Topsham, into the river Tone, in the parish of Bishop's Hull, in Somersetshire, which canal will pass through the several parishes of Topsham, Heavytree, Sowton, Pinhoe, Honiton's Clyst, Broad Clyst, Clyst St. Lawrence, Clyst Hydon, Plymtree, Culdampton, Kentisbeer, Uffculme, Welland, Halberton, Burlescombe, and Holcomb-Rogus, in Devonshire, and through the several parishes of Ashbrittle, Kitsford, Langford, Budville, Thorn St. Margaret, Wellington, Ninehead, Hill Farrants, Bradford, and Bishop's-Hull, in Somersetshire ; and they may make the following cuts ; a cut from the canal in a field of

Edmund Frost of Cullompton, into another field of Ferdinand Mills in the same parish; another cut in a field of Richard Corner, of the parish of Burlescombe, into another field of Thomas Hawks, in the parish of Tiverton; and may make another cut in a field of William Bird, of Wellington, to another field of John Slade, which canal and cuts are described in a plan with a book of reference, and deposited with the clerks of the peace for the counties of Devon and Somerset.

And the company may erect two reservoirs in the valley of the river Culm, and two in the valley of the river Tone, and make channels to convey water therefrom. And they may supply the canal with water from the rivers Culm and Tone, and from all such springs as shall be found within 2,000 yards of the canal and cuts or reservoirs; and for that purpose may make such feeders and aqueducts, weirs, engines, and other machines as they may think proper; but the canal shall not deviate more than 100 yards from the line laid down in the plan and book of reference. The canal shall not exceed 30 yards in width with its towing-path, banks, and fences, except where any dock, basin, or reservoir shall be made, or where it shall be raised higher or cut deeper than six feet lower than the present surface, and except in places allotted for vessels to lie in, or where any wharf shall be made, or warehouse, crane, or weighing-engine shall be erected; nor more than 150 yards in any place, except in a common.

If the company shall judge it expedient, they may cause rollers, inclined planes, or other works to be made at such places as they think proper, and the same shall be considered as part of the canal. The

road-bridges not to rise more than  $2\frac{1}{2}$  inches in a yard in length; and if, on account of situation, a swivel or wooden bridge would be more convenient to the public than a bridge of stone or brick, that the approach thereto cannot be made without great expense or less ascent than  $2\frac{1}{4}$  inches in a yard in length, they may have liberty to alter them to accommodate the public.

So much of the river Tone as lies between the canal in the parish of Bishop's Hull and Taunton bridge, being the distance of 500 yards, shall be deemed part of the canal, and shall be vested in the company, who may cleanse and make navigable the same.

The company may raise among themselves such sum as they think proper, not exceeding 220,000 *l.* to be divided into shares of 100 *l.* each; and no person to be a proprietor of less than one share, or more than 100, and every proprietor to have a vote for each share, but not exceeding 20 by himself or proxy. And if the said sum of 220,000 *l.* be insufficient, they may raise 110,000 *l.* more, either amongst themselves or by the admission of new subscribers, or borrow at interest the same. The canal, when completed, shall be measured, and stones or posts erected on the sides thereof to denote every mile.

The company may make navigable cuts from the canal to any place within the distance of five miles thereof, and all such cuts when completed shall be deemed part of the canal. And this shall be deemed a public act.

N. B. An uncommon number of clauses are enacted in this very long act to secure private property, and

also to explain the power of the company. The articles of traffic are numerous, and the tonnage and rates are many, but chiefly the same as in all navigation acts; but neither the length, rises or falls are given.

**DORSET AND SOMERSET CANAL. 1796.**

The preamble sets forth, that the making and maintaining a navigable canal from or near a place called Gain's Cross, in the parish of Shillingston Okeford, in Dorsetshire, to communicate with the Kennet and Avon canal, at or near Widbrook, near Bradford in Wiltshire; and the navigable branch hereafter described from the intended canal, will open an easy communication with many considerable manufacturing places in the country through which the same is intended to pass, and with the extensive collieries near Mendip, in Somersetshire, and will render the conveyance of goods less expensive, and will be of great public utility; it is therefore enacted, that (now follow the names of a vast number of proprietors) and their successors, shall be incorporated by the name of The Company of Proprietors of the Dorset and Somerset Navigation, and may make a canal navigable for vessels from or near a place called Gain's Cross, in the parish of Shillingston Okeford, in Dorsetshire, through the parishes of Shillingston Okeford, Okeford-Fitz-Pain, Hammoon, Sturminster, Newton, and Stalbridge in that county, and through the parishes and townships of Henstridge, Whitchurch, Yenston, Temple, Abbas Coombe, Horsington, South Cheriton, North Cheriton, Maperton, Wincanton, Charlton, Musgrove, Shepton, Montague, South Brewham, North Brew-



ham, Witham-Friary, Trudoxhill, Nunney, Marston Bigot, Frome Selwood, Rodden, Standerwick, Berkeley, Beckington, and Road, in Somersetshire ; and through the parishes and townships of Wingfield, Farleigh, and Bradford, in Wiltshire, to communicate with the Kennet and Avon canal at or near Widbrook, in the same county ; and also a branch from the canal in the parish of Frome Selwood, through the parishes and townships of Frome Selwood, Marston, Marston Bigot, Elm, Mells, Babington, Kilmersdon, Halcombe, Stratton on the Fosse, and Midsummer Norton, in Somersetshire, to that part of Nettlebridge which is in Midsummer Norton ; and may supply the canal and branch with water from rivers, brooks, and water courses, within 2,000 yards thereof, and may make reservoirs within that distance, feeders, aqueducts, and erect fire-engines, or other machines ; may make rail-ways or roads to the canal ; may also make bridges, tunnels, sluices, locks, drains, wharfs, quays, warehouses, landing places, weighing beams, cranes, steam-engines, dry docks, and other works requisite.

The lands to be used for the canal and branch, with the towing-paths, ditches, drains, and fences, shall not exceed 30 yards in width, except where any dock, basin, or reservoir shall be made, or where the canal or branch shall be raised higher or cut deeper than six feet from the present surface of the land, or where vessels lie or pass each other, or where any crane, wharf, warehouse, or landing-place for goods, nor there more than 100 yards ; nor deviate from the plan and book of reference lodged with the clerks of the peace for the counties more than 100 yards. The company are empowered to use rollers if neces-

sary, or inclined planes, iron rail-ways, or any other works they may think proper.

The company may raise among themselves 150,000 *l.* to be divided into shares of 100 *l.* each, and each share entitles a person to vote personally or by proxy; but no one, to give more than 20 votes, let his number of shares be what they may. And if the above sum is insufficient to complete the canal and branch, they may raise 75,000 *l.* more, either among themselves or by admission of new subscribers, or borrow on interest. The canal shall be measured, and stones or posts erected at every half mile. The owners and occupiers of adjoining lands may have pleasure boats on the canal, (not passing through any lock) without paying any rate, so as they are not made use of to convey goods or other things, and so as not to obstruct the navigation; nor shall such pleasure boats be above 12 feet long, nor above five feet broad. And this shall be deemed a public act.

N. B. There is a multitude of clauses to secure private property, especially in the mines with which the country abounds through which the canal is intended to pass, and by the number of articles enumerated in the rates of tonnage, this canal bids fair to equal, if not surpass, most of the kind in this kingdom; the usual navigation clauses are also plentifully inserted in the act. The trade to the collieries seems boundless, and will be of the utmost importance to the consumer, the owner, and the canal proprietor.

SOMERSETSHIRE COAL CANAL TO THE KENNET AND  
AVON CANAL, TO AMEND. 1796.

The preamble recites 34 Geo. III. cap. 86, for making and maintaining a navigable canal, with certain rail-ways and stone roads, from several collieries in the county of Somerset, to communicate with the intended Kennet and Avon canal, in the parish of Bradford, in the county of Wilts; whereby several persons therein named and their successors were incorporated by the name of the Company of Proprietors of the Somersetshire Coal Canal Navigation, and states that they have begun to make the canal, and are desirous to finish it, but find on examination of lands that it would be much more convenient to the public if, instead of the line directed to be pursued by the act, they were empowered to vary it on the Radstock-line in three or four places, and on the Dunkerton-line in several places, to the proposed junction with the Radstock line, in the parish of Southstoke, and also to vary the line of the canal from such proposed junction of the said two lines, to the proposed junction with the Kennet and Avon canal on the west side of the river Avon, in the parish of Monkton Coomb, in the said county, which variations will prevent the necessity of a tunnel, will pass through land of inferior value, will be executed at much less expense, and will be more convenient to the public than the present line, if the said act was amended, and powers were given to the company to make such variations; it is therefore enacted, that the company may vary the canal on the Radstock line from the western extremity of an orchard on the north-west of Pigliness farm-house,

in the parish of Wellow, and also on the Dunkerton line to the proposed junction with the Radstock line at Southstoke, according to the plan and book of reference deposited with the county clerks for the inspection of all concerned, who may have copies thereof.

The company may do all matters requisite for making, maintaining, and using the variations, and for making bridges, locks, inclined planes, reservoirs, wharfs, quays, landing-places, weigh-beams, cranes, engines, and other things in as ample manner as they are authorised to execute the works directed to be made under the recited act, by which act the company was enabled to raise 40,000*l.* and this act not authorising to raise another supply if wanted, leaves a supposition that the above sum will complete the work. This is deemed a public act.

N. B. There are a few clauses to secure private property, and the usual clauses in navigation acts. By the map of the country the variations appear much for the better, as the coals will be delivered sooner and cheaper, which to the labourer and manufacturer is of great consequence, as well as to the owner.

#### TAMAR NAVIGATION. 1796.

The preamble sets forth, That making and maintaining the river Tamar navigable for vessels from Morwellham Quay, in the parish of Tavistock, in Devonshire, to or near a place called Boat Pool, near Blanch Down, in the said parish; and a canal from Boat Pool to or near Tamarton-bridge, in the parish of North Tamarton, in the county of Cornwall, and a collateral cut from the canal at or near Poulson-bridge, in the parish of Lifton, in Devonshire, to

Richgrove Mill, in the parish of Launceston, and county of Cornwall, will greatly facilitate and render less expensive the conveyance of goods; will materially assist agriculture, and will be of great public utility and advantage :—It is therefore enacted, that (here follow the names of proprietors) and their successors shall be incorporated by the style of the Company of Proprietors of the Tamar Manure Navigation. And the company may raise among themselves 81,000*l.* for making the canal and other works, which shall be divided into shares of 50*l.* each, and no proprietor to have less than one or more than 100 shares, which shall be deemed personal estate; but no person to have above 20 votes by himself or proxy; and if the sum of 81,000*l.* should not be sufficient, they may raise 40,000*l.* more, either among themselves, or admission of new subscribers, or borrow on interest.

The company are empowered to make the river Tamar navigable for vessels, with cuts from Morwellham Quay to Boat Pool near Blanch Down, in Devonshire; and from thence a canal from Blanch Down through Tavistock, Lamerton, South Sydenham, Milton Abbot, Dunterton, Bradstone, Lifton, Werrington, St. Giles in the Heath, Northcott, Luffingcott, Tetcott, and Clawton, all in the said county, to or near Tamarton-bridge, in the parish of North Tamarton, and county of Cornwall; and a collateral cut from the intended canal at or near Poulson bridge, in the parish of Lifton, in Devonshire, to Richgrove Mill, in the parish of St. Stephen, near Launceston, in the county of Cornwall, through the parishes of St. Stephen, St. Thomas, and St. Mary Magdalen in the said county; and to supply

the navigation with water from the river Tamar, and from all springs and water courses found in cutting the canal, or within 2000 yards from the head level thereof, or within 1000 yards from any part, and may make tunnels, aqueducts, and channels, cleanse, deepen, or straighten streams or water courses, and may make bridges, locks, flood-gates, weirs, dams, drains, wharfs, quays, warehouses, landing places, weighing beams, cranes, fire engines, dry docks, roads, and other works and conveniences where requisite. They may also cause rollers, inclined planes, rail-ways, or other works to be made for that purpose, which shall be considered as part of the navigation; every lock shall be of the width, in the clear, of 5 feet, or of 9 feet 9 inches, or of some intermediate width between the said dimensions, and of the length of 12 feet 6 inches, or of some multiple thereof. Exclusive of the space necessary for opening the lock-gates, the breadth of the canal, towing-paths, ditches, drains, and fences not to exceed 25 yards, except where a dock, basin or pen of water shall be made, or where the canal shall be raised higher or cut above 5 feet deeper than the surface, and where it shall be judged proper for vessels to lie or pass each other, or where any warehouses, weighing beams, cranes or wharfs may be erected.

The company may use certain lands at or near Blanch Down House near Blanch Down, for making a basin, warehouses, cranes, wharfs, and watch-houses, but not to exceed 2 acres.

To make compensation for the injury the fishery in Calstock pool, and other parts of the river Tamar, belonging to the Prince of Wales in right of his

Duchy of Cornwall, and held by Lord Edgcombe, they agree to give 200*l.* a year for the remainder of the lease of 99 years, from 1791, and the same sum yearly to his Royal Highness when it reverts into his hands. A plan and book of reference is deposited with the clerk of the counties for inspection, and the canal shall not deviate from the line laid down there more than 100 yards, without consent of the land owners. This shall be taken and deemed a public act.

N. B. There are a number of clauses to secure private property, especially corn mills as well as others, and particularly so in being permitted to purchase and pull down Tetcott mills, Northcott mill, and Bradstone mill. There are also the usual clauses as enacted in all navigation acts, such as mines, minerals, manufactures, &c. &c. &c.

#### LEOMINSTER CANAL, TO COMPLETE. 1796.

The preamble states, that by an act of 31 Geo. III. cap. 69, for making and maintaining a navigable canal from Kington, in the county of Hereford, by or through Leominster, to join the river Severn, near Stourport bridge, several persons are incorporated by the name of the Company of Proprietors of the Leominster Canal Navigation, and are authorised to make the said canal, and raise money to defray the expense not exceeding 190,000 *l.* and as it will require a further sum to complete the same, it is enacted that the company may raise among themselves, or admit new subscribers towards raising any sum not exceeding 180,000 *l.* to be divided into new shares of the like value as the shares created by virtue of the recited act, or on interest by way of mortgage

or bond, and the money so to be raised shall be applied in defraying the expense of finishing the canal and its works, which new shares shall be deemed personal estate, and the subscribers of the new shares shall become proprietors, and be incorporated with the company; and the several powers and provisions contained in the recited act shall be extended to the calling for, raising, and recovering the subscriptions for the new shares, and for transferring and entering the same in like manner as if the sums so to be subscribed were part of the money authorised to be raised by virtue of the recited act. And this is deemed a public act.

THE ELLESMERE CANAL, TO EXTEND AND VARY.  
1796.

The preamble states, that by an act of 33 Geo. III. cap. 91, for making and maintaining a navigable canal from the river Severn, at Shrewsbury, &c. certain persons were incorporated by the name of The Company of Proprietors of the Ellesmere Canal, and were empowered to make and maintain the said canal, and were to raise among themselves such sums as the act mentioned; and as the company have begun to make the canal, and have raised a considerable sum, part whereof has been laid out in this undertaking, but it is found that the powers given by the recited act require to be amended; and as it appears, on a re-survey of the country of those parts of the canal which remain unfinished, that it will be convenient to vary some parts of the line, and to make and maintain several other collateral cuts to communicate therewith, which will be of great public utility; it is therefore enacted, that the company



shall be empowered to vary and alter the canal and cuts as hereinafter mentioned : three collateral cuts are now specifically mentioned : and which additional branches of the Ellesmere canal are intended to be made and pass through the parishes of Whittington, Ellesmere, Welchampton, Prees, Whitchurch, and Wem, and the townships of Francton, Tetchill, Birch, and Lythe, Ellesmere, Oatley, Newton, and Spoonhill, Lineal, Welchampton, Whixhall, Tilstock, Alkington, Dodington, Steel, Prees, Edstaston, and Cotton, in Shropshire, and through the parish of Hunmer, and the townships of Bettesfield and Brunnington, in Flintshire ; and the Ellesmere canal company may make, erect, and perform all such works and things as shall be requisite for making and maintaining the several variations, additional branches, and extensions of the canal and cuts, and for these purposes shall have and enjoy the like powers as are granted by the recited act of 33 Geo. III. and the recited act shall, so far as the nature and circumstances of the case will admit, extend to, and shall put in execution in making and using the variations, additional branches, and extensions, and for the punishments of offences, and for the selling and conveying of premises, and ascertaining their value, and assessing of damages, and all other matters which shall arise in consequence of making and using the variations, additional branches, and extensions ; and shall also be used and exercised by the owners of premises ; and the commissioners under the recited act of 33 Geo. III. shall be commissioners for the purposes of this act.

A plan and book of reference shall be left with the clerks of the peace of the counties of Salop and

Flint, and with the clerk of the company, for perusal of the canal and variations with the collateral cuts; and as by the recited act the lands to be taken for the canal should not exceed in any place 45 yards in breadth, and if that breadth is insufficient, it is enacted, that in all cases where it shall appear to the commissioners, or any seven of them, that a greater breadth than 45 yards of land should be taken, the company may take such further width as shall appear reasonable; and the amount of the purchase-money, and of damages, to be ascertained, paid, and disposed of in like manner, subject to the verdict of a jury, as by the recited act is directed in respect to lands. And this is deemed a public act.

N. B. There are a vast many long clauses for securing private property, and explaining the nature and course of the variations and extensions, as also several other intended junctions and surveys, intending seemingly to apply again to parliament for further powers to extend this canal and its branches into other navigations for the promoting trade and commerce; the usual navigation clauses are also inserted.

WARWICK AND BRAUNSTON CANAL, TO VARY AND  
AMEND :

*And now to be called the Warwick and Napton Canal. 1796.*

The preamble states, that by 34 Geo. III. cap. 38, certain persons, incorporated by the style of The Company of Proprietors of the Warwick and Braunston Canal Navigation, were authorised to make a navigable canal from the Warwick and Birming-

ham canal, in the parish of Buddbrooke, in Warwickshire, into the Oxford canal at Braunston, in Northamptonshire; and as the company, having made great progress in the canal, now find that if the same was to be completed in the line prescribed between the Fosse Road, in the parish of Offchurch, in Warwickshire, and the parish of Braunston, it would be attended with much inconvenience, as a tunnel of more than 800 yards in length must be made thereon; and as the company have caused surveys to be made, that line of the canal may be abandoned, and instead thereof carried from the Fosse Road, through a part of the parish of Offchurch, and the parishes of Bascote, Long Etchington, Stockton, Burdington, Lemington, Hastings, Bradwell, Grandsborough, Caldecot, and Napton, to join the Oxford canal, in the parish of Napton, in Warwickshire, and may make, erect, and perform all such works and things as shall be requisite for making and maintaining the canal, and supplying the same with water, and the powers of the recited act, so far as the nature and circumstances of the case will admit, subject to the several alterations and amendments hereby made, shall be exercised by the company, and shall be applied and put in execution for making and maintaining the said part of the canal, and other necessary works, and for defraying the expences thereof.

The company shall be incorporated by the name of The Company of Proprietors of the Warwick and Napton Canal Navigation, instead of their present style; and the canal shall be called The Warwick and Napton Canal Navigation.

A plan and book of reference shall be deposited with the clerk of the peace for Warwickshire, and another with the clerk of the company, to which all persons may resort ; and the company, in making the canal, shall not deviate from the course delineated on the plan.

In case the sum of 100,000 *l.* authorised to be raised by the recited act, shall be found insufficient for making and maintaining the canal and other works, the company may raise among themselves, or borrow at interest, on mortgage or bond, 30,000 *l.* and if any of the proprietors shall pay any proportion of such further sum, the company shall order a proportionate share of the dividends to be paid to them, over and above the dividends payable on their original shares. And this shall be deemed a public act.

N. B. There is in this act a vast number of clauses for securing private property, as well as the property of other canals which this canal interferes with ; and if one may be permitted to form a judgment from the large sums of 5,000 *l.* and 10,000 *l.* yearly paid to other canals, and the locality of this canal with coals, mines, and minerals, with lime, lime-stone, and manure, together also as being as it were in the heart of manufactures and manufactories, we may venture to pronounce it a most lucrative and useful navigation ; the usual navigation clauses are also inserted and enforced in this amended and enlarged act.

ELLESMERE CANAL, TO VARY AND EXTEND TO  
RUABON. 1796.

The preamble states, that by 33 Geo. III. cap. 91, for making and maintaining a navigable canal from the river Severn at Shrewsbury, certain persons therein named, with such other persons, bodies politic, &c. as should be appointed, were incorporated by the name of The Company of Proprietors of the Ellesmere Canal Navigation, who were empowered to make the above canal; and by an act of this session to explain and amend the above act, the company have been empowered to vary the line of the canal and cuts between Francton Common and Whitchurch, and to make and maintain several new branches to communicate therewith, and such additional and collateral cuts will be of great public utility: It is therefore enacted, that the company shall vary the line originally intended for the canal, and maintain a new branch from the canal at or near Pont-Cysylty, in the parish of Ruabon, in Denbighshire; and from a part of such intended new branch of the canal on Cefu Common, in the parish of Ruabon, to the turnpike road leading to Acrefair coal-works, in Denbighshire; and from a part of the new branch of the canal, in the parish of Gresford, in the county aforesaid, to or near the Falwern coal-works, in the parish of Mold, in Flintshire; and from Gresford to a field near the river Allen, in the township of Allington, Denbighshire; which several variations and extensions of the Ellesmere canal will pass through the parishes of Ruabon, Wrexham, and Gresford, and townships of Christioneth, Kenrick, Bodylton, Rhyddalt, Morton Above, Morton

Below, Esclusham Below, Bersham, Broughton and Brumbo, in Denbighshire; the parishes of Gresford, Hope, and Mold, and townships of Marford, Uch-y-Mynydd-Ucha, Uch-y-Mynydd-Issa, and Tryddin, in Flintshire; the parishes of Pulford, Dodleston, and St. Mary-on-the-Hill, and the townships of Pulford, Dodleston, and Marston-cum-Leach, in Cheshire, the parish of St. Mary-on-the-Hill, and a place called Saltney Side, in Chester; and the company shall make and perform all works and things requisite for making and maintaining the several variations, additional branches and extensions of the canal and cuts hereby authorised to be made, and shall have the like powers in the lands through which the same shall be made as are given by the recited act of 33 Geo. III. or by the recited act of this session. A survey has been made, and a plan with a book of reference is deposited with the clerks of the counties through which the canal passes, and with the clerk of the company; and the works not to deviate more than 100 yards from the course delineated in the plans. And this is deemed a public act.

N. B. Numerous are the clauses in this bill for securing private property to individuals, which would be both tedious and useless to the majority of the readers, especially the uncouth names of the places in Wales. Those who are interested and want further information, can apply to the clerk of the company or county. It appears several other branches and cuts, if not independent canals for navigation, are in agitation, for Messrs. Jessop and Dadford, engineers, have been employed by this company for further extensions, which have been found practicable. This

canal, intersecting with the river Dee company and Chester canal, makes the bill appear confused and not easily explained by often repetition, but on the spot. The usual clauses in all navigation acts are also inserted.

LANCASTER CANAL, TO VARY AND AMEND. 1796.

The preamble states, that by 32 Geo. III. cap. 101, for making and maintaining a navigable canal from Kirkby Kendal, in the county of Westmorland, to West Houghton, in the county palatine of Lancaster, &c. several persons were incorporated by the name of The Company of Proprietors of the Lancaster Canal Navigation, and they were restricted from deviating more than 100 yards from the course marked on the plan and set forth in the book of reference; and as it is found necessary to cut the canal through certain lands, parcel of the possessions of his Majesty's Duchy of Lancaster, according to the line described in the recited act, it is also necessary to alter the original line in some parts, and as his Majesty is not by virtue of the recited act, empowered to sell any land in fee, for the purpose of carrying on the works of the canal, and as it is conceived that the proposed line will prove beneficial to the lands as well as of general utility: It is enacted, that the Chancellor and Council of the Duchy of Lancaster may sell and assure in the name of his Majesty, under the seal of the Duchy, to the use of the company, for a reasonable price, so much of the lands before-mentioned as shall be necessary for the purposes aforesaid, and which shall be set out in pursuance of the directions in the recited act of 32 Geo. III, subject to the regulations therein mentioned, (except

so far as the same are altered by this act) for a reasonable sum; and on payment of the sum agreed on between the parties, the Chancellor, by any deed under the seal of the Duchy in the name of his Majesty, may convey the lands to the company, which deed being enrolled in the court of the Duchy chamber within 12 months from the date, shall be valid.

The purchase-money shall be paid by the company to the Receiver General of the revenues of the Duchy, and shall be applied as the Chancellor and Council shall appoint, according to the provisions of an act of 19 Geo. III. to enable the Chancellor and Council of the Duchy of Lancaster to sell and dispose of certain fee farm rents, &c.

Saving to all persons and bodies politic, &c. (except the King in right of his Duchy of Lancaster) all such estate and interest which they could have enjoyed in the premises hereby granted in case this act had not been made.

This shall be allowed in all courts as a public act.

#### DUDLEY CANAL, TO AMEND. 1796.

The preamble recites three acts of the 16th, 25th, and 30th Geo. III. whereby divers powers were given for making and maintaining a navigable canal within and from certain lands belonging to Thomas Talbot Foley, esq. in the parish of Dudley, in Worcestershire, to communicate with the Stourbridge navigation at Blackdelph-upon-Pensnett Chase, in the parish of Kingswinford, in Staffordshire, and for making an extension of the said canal to the Birmingham canal at or near Tipton Green, in the same county, and several persons were for these purposes incorpo-



Cornwall, to or near Dunmeer bridge, in the parish of Bodmin in the same county, and a collateral cut therefrom at or near Cotton Wood, in the latter parish, to or near Ruthern bridge, in the same parish, will greatly facilitate and render less expensive the carriage of coals, timber, stone, and other articles, will materially improve the agriculture of the adjoining country, and will be of great public advantage : It is therefore enacted, That (here follow the names of the company of proprietors) and their successors shall be incorporated by the style of the Company of Proprietors of the Polbrock Canal, and shall have perpetual succession.

The company may contribute among themselves 18,000*l.* for making and maintaining the canal and other works, which shall be divided into shares of 50*l.* each, and no person shall be a proprietor of less than one share, or of more than 100 shares, unless by will or marriage; and the shares shall be deemed personal estate ; every subscriber shall have a vote, not exceeding 10 votes by himself or proxy.

The canal shall be made through the parishes before mentioned, and shall be supplied with water from the river Camel or Allen, and from all rivers, springs, or water courses found in making the same, or within 2000 yards from the head level thereof, or any other part of the navigation. May make tunnels, aqueducts, and channels, cleanse, deepen, or straighten all streams and water courses which may communicate therewith, and may cut or raise the banks of the river Camel, may also make bridges, locks, flood-gates, weirs, dams, drains, wharfs, quays, warehouses, landing places, weighing beams, cranes, fire-engines,

dry docks, or other machines and conveniences where requisite.

The lands to be taken for the canal and collateral cut, towing-path, ditches, drains, and fences, shall not exceed 30 yards in breadth, except where basins, docks, or pens of water shall be made, or where the navigation shall be raised higher or cut above 6 feet deeper than the surface of the land, and where it shall be judged proper for vessels to lie or pass each other, or where any warehouses, cranes, or weighing beams may be erected, or wharfs, or other places set out for the reception of goods, nor in such places more than 153 yards in breadth without the consent of the land owner. A plan and book of reference are left with the clerk of the county, and with the clerk of the company.

The company may make use of certain lands at or near Guinea Port, in the parish of St. Breock, near Wadebridge, for making a basin, and may thereon erect warehouses, cranes, weighing beams, fire engines, and other buildings not exceeding 2 acres, and they may alter and make use of a road leading from Guinea Port to Tregudick bridge, in the said parish, for conveying articles to and from the canal. The company may also make use of 2 acres of land near Stoney Lane bridge, in the parish of Bodmin, for making a basin and necessary erections for the use and accommodation of those navigating on the canal; as also on any part of the canal where necessary, the company are empowered to make tunnels, aqueducts, arches, drains, trenches, water courses, watering places for cattle, back drains, fences, towing-paths, locks, sluices, cranes, engines, &c. And this shall be deemed a public act.

N. B. The clauses to secure private property are but few, being chiefly over an uncultivated country; but the clauses used in navigation acts are multiplied. By the rates and tolls, and the heavy goods the produce of the country passing thereon, it does appear to be a most promising, profitable undertaking.

GRANTHAM CANAL, TO AMEND. 1797.

The preamble states, that by an act of 33 Geo. III. cap 94, certain persons were incorporated by the style of the Company of Proprietors of the Grantham Canal Navigation, and were authorised to make a navigable canal from Grantham in Lincolnshire, to the river Trent, near Nottingham, Trent bridge, and also a collateral cut from such canal at Cropwell Butler to Bingham, in Nottinghamshire, and to raise among themselves a competent sum for completing the same, not exceeding 75,000*l.* and if that should be insufficient, they may raise 30,000*l.* more, of which 20,000*l.* were to be raised by subscription, or shares of 100*l.* each, by any member of the company, and 10,000*l.* by mortgage; but doubts have arisen whether the proprietors are compellable to raise the 20,000*l.* among themselves; and states that the company have expended the 75,000*l.* and at a special meeting, 28th Oct. 1795, invested their committee to call upon the subscribers for 10 per cent. on the original subscription, which they did, and directed the same to be paid by the 8th December, 1795; and on the 5th of May, 1796, being their general annual assembly, the company made another call of 10 per cent. on the proprietors, and directed the same to be paid the 8th of June, 1796; and three-fourth parts of such two calls, which amount toge-

ther to 15,000*l.* have been already paid and expended in making the canal, but the residue of such two calls still remains unpaid, several proprietors resisting the payment thereof, although agreed to be raised by the unanimous consent of the meeting; and the company have borrowed 5,200*l.* being as much of the said 10,000*l.* as it ~~has~~ been in their power to procure on mortgage, and have also incurred sundry other debts in the prosecution of the undertaking, and for arrears of interest on borrowed money, and that the company have nearly completed their undertaking; but to enable them to finish it, and to liquidate the debts contracted, and to provide for the general purposes of the undertaking, have occasion for a larger sum than they have at present a power to raise, and that the recited act has been found defective, (now follow various regulations for the calls and payment of interest of the first and second subscription and mortgage) and proceeds: So much of the recited act as enables the company to raise 20,000*l.* or so much thereof as they might think proper to raise by subscriptions or shares of 100*l.* each, by any proprietor of the company, or as enables them to grant securities for shares of 100*l.* each of the said sum of 20,000*l.* shall be repealed, and instead thereof the company may raise any sum not exceeding 24,000*l.* over and above 75,000*l.* The 15,000*l.* hereby consolidated therewith, and the 10,000*l.* which they were empowered to borrow by the recited acts, and the money so to be raised, shall be applied in defraying the expense of completing the works authorised to be done, and in discharging the debts contracted, and the 24,000*l.* so to be raised shall be divided into shares of 120*l.* each,

and be deemed personal property, and any proprietor may subscribe for any number of shares therein, not exceeding 5, and if not filled by the old proprietors new subscribers may be admitted, who shall not hold more than 15 shares, and every new holder of shares of 120*l*. shall be entitled to give one vote for every such share, not exceeding 15. And this shall be deemed a public act.

N. B. The greatest care possible appears to have been taken to secure subscribers, proprietors, and mortgagees in this very complex business, and to fix the calls and certainty of paying the interest regularly, to induce monied people to promote the navigation.

**TRENT AND MERSEY CANAL, TO EXTEND. 1797.**

The preamble states, that by 6 Geo. III. cap. 96, for making a navigable canal from the river Trent, at or near Wilden Ferry in the county of Derby, to the river Mersey, at or near Runcorn Gap, certain persons therein named were incorporated by the name of the Company of Proprietors of the Navigation from the Trent to the Mersey, and were empowered to make and maintain the said canal; that the company have, in pursuance of the recited act, and of 10 Geo. III. cap. 102, and 15 Geo. III. cap. 20, made and completed the canal; that by 16 Geo. III. cap. 32, the company have made another canal from the Trent and Mersey on the south side of Harecastle to Froghall, and a rail-way from thence to or near Caldon; that by 23 Geo. III. cap. 33, the two canals were united and made one joint undertaking; that by a survey lately made it appears that a canal may be made from the last mentioned

canal, which is now called the Caldon canal at Endon, to Leek, in Staffordshire, which will open an easy commercial intercourse between the canals and Leek, and be of public utility; and that a reservoir may be made in Rudyerd Vale, with a trench from such reservoir to the canal near Leek, which will afford a supply of water for the canals in all dry seasons. It is enacted, that the company may take and maintain a canal from the Caldon canal at Endon, to the town of Leek, and supply it with water, and also may make a reservoir in Rudyerd Vale, in Staffordshire, with a trench therefrom for conveying water to canals, and also may form a communication between the proposed canal and such part of the Caldon canal as lies between Hazlehurst Wood, near Endon and Froghall, and perform all such matters and things as may be necessary for making and maintaining the canal, reservoir, and other works.

A plan and book of reference of the line of the canal shall be left with the clerk of the peace for Staffordshire, and another with the clerk of the company, which line shall not be deviated from without the land-owners' consent; and the company may borrow at interest 10,000*l.* and assign over the canal and rates as a security for the same. And this shall be deemed a public act.

N. B. The breadth of the canal, and clauses securing private property, with permission to erect conveniences for carrying on the trade on this canal, are inserted in those acts that are before recited, to which those concerned may refer, and need no repeating; and the usual navigation clauses are but few for the above reason. They only mention their care to preserve the mills and water in the rivers Churnet, Dove, and Trent.

## LEICESTER CANAL, TO AMEND. 1797.

The preamble recites act 31 Geo. III. cap. 65, whereby certain persons and their successors, incorporated by the style of the Company of Proprietors of the Leicester Navigation, were authorised to make a navigable canal between the Loughborough canal and the town of Leicester, by making certain cuts, and by rendering the rivers Soar and Wreake navigable, and also several rail-ways or stone roads and water levels, in order to make a communication between certain places and mines in the county of Leicester, and the Loughborough canal, and to raise 46,000*l.* towards defraying the expenses thereof, and if that should be found insufficient, to raise 20,000*l.* more ; and as the company have nearly completed the navigation, in which they have already not only expended the said two sums, but have contracted nearly 14,000*l.* debt, and some parts of the works are still incomplete : It is therefore enacted, That the company may contribute among themselves, or by mortgage, in the manner expressed in the recited act, 18,000*l.* to be applied in defraying the expenses of obtaining this act, and of completing the works aforesaid, and in discharging the company's debts, and the several provisions contained in the recited act shall extend to this act, and the proprietors in respect of the 18,000*l.* shall be entitled to a proportionable part of the profits that shall arise by virtue of the recited and this act. And this shall be deemed a public act.

N. B. This canal interfering with the Melton Mowbray, the Oakham, and other canals, the clauses to secure the several proprietors, as also private property, are numerous and complex, for all which those concerned may be informed by perusing the former

recited and this act, but to the generality of readers it would appear tautology and uninteresting. The usual clauses in all navigation acts are also here inserted.

GLOUCESTER AND BERKELY CANAL, TO VARY. 1797.

The preamble states, that by 33 Geo. III. cap. 97, for making and maintaining a navigable canal from the river Severn at or near the city of Gloucester, into a place called Berkely Pill, in the parish of Berkely, and also a cut to or near the town of Berkely, in the county of Gloucester, certain persons were incorporated by the name of the Gloucester and Berkely Canal Company, with powers to make a navigable canal from the river Severn near Gloucester to Berkely Pill, in such line as is described in a map and book of reference deposited with the clerk of Gloucestershire, and that by a deviation from the said line, the deep cutting in the several parishes of Slimbridge, Frampton-upon-Severn, Fretherne, Saul, Wheatenhurst, Moreton Valence, and Standish, might be avoided; advantages would accrue to the land owners, the line of the canal would be shortened, the navigation improved, a great expense would be saved, and the completion of the canal would be expedited: It is therefore enacted, that so much of the recited act as restrains the company from deviating from the line of the canal, without the consent in writing of the persons through whose lands such deviation should be made, shall, so far only as relates to the lands within the parishes of Stourbridge, Frampton-upon-Severn, Fretherne, Saul, Wheatenhurst, Moreton Valence, and Standish, in Gloucestershire be repealed, and the company may



make the canal through those parishes in such line as is described in a map and book of reference deposited with the clerk of the peace for the county of Gloucester, but not to alter this deviation.

The like tonnage and wharfage as would have been paid to the company by virtue of the recited act, if the line of the canal had not been varied, shall be paid on the deviated line.

And as by the recited act the company was authorised to raise among themselves a sum not exceeding 140,000*l.* to be divided into 1400 shares of 100*l.* each, and in case that sum should be found insufficient they might raise 60,000*l.* more, either among themselves or the admission of new members, or on mortgage, and the company have hitherto been unable to raise the whole of the 140,000*l.*; and as doubts have arisen whether the company are authorised by the recited act to raise the further sum of 60,000*l.* until 140,000*l.* shall have been actually advanced; it is enacted, that when the sum of 100,000*l.* shall have been paid on calls made under the recited act, or of this act, the company may raise the remainder of the 140,000*l.* as also the 60,000*l.* either by admission of new subscribers for shares of 100*l.* half-shares of 50*l.* or quarter-shares of 25*l.* or by mortgage or bond; but for so many of such parts as make together one whole share one vote only shall be admitted, and no person shall hold more than 50 shares. And as the Gloucester and Berkely Canal, by means of the intended deviation, will intersect the Stroudwater navigation at a point on its lowest level, and it is expedient that such level should be raised and varied to a place more to the west, for the crossing of both navigations, and below the intended junction in the recited act: It is enacted, that the Gloucester and

Berkely canal company may lengthen and continue the upper reach or level of the Stroudwater navigation, and raise and vary so much of the lowest reach or level as may be answerable thereto for any extent not exceeding 1200 yards; such extent to be computed from the upper part of the Head of the Whitminster lock downwards upon the navigation towards the west; and to perform all works necessary thereto: and for these purposes they may change the course of the Stroudwater navigation within the limits aforesaid, agreeable to the plan of the intended deviation aforesaid; and they may raise all such mounds and embankments as shall be necessary, and keep the same in proper repair. And this shall be taken and deemed a public act.

N. B. The many clauses and restrictions against entering or injuring private property, prove the care that parliament takes in protecting as well as promoting all useful undertakings, and that no injury shall be sustained by individuals, even at the expense of public utility; the clauses as in other navigation acts, as usual.

#### TRENT AND MERSEY CANAL, TO EXTEND. 1797.

The preamble states, that by 6 Geo. III. cap. 96, for making a navigable canal from the river Trent, at or near Wilsden Ferry, in the county of Derby, to the river Mersey at or near Runcorn Gap, certain persons were incorporated by the name of The Company of Proprietors of the Navigation from the Trent to the Mersey, with authority to make and maintain a navigable canal from the river Trent below Wilsden Ferry, in Derbyshire, to the river Mersey at or near Runcorn Gap, and several commissioners were appointed by the act to carry it into execution; and

that the company, in pursuance of that act, and another passed in the 10th of his present Majesty to amend it, and another passed in the 15th of his Majesty to amend and render more effectual the two acts, have made and completed the said canal; and by virtue of another act passed in the 16th of his Majesty, have completed another navigable canal from the first-mentioned canal on the south side of Harecastle, to Froghall, and a rail-way from thence to or near Caldon, in Staffordshire; and by another act passed in the 23rd of his Majesty, the two canals were united and made one joint undertaking; and as by surveys lately made, it appears that a navigable canal may be made out of the last-mentioned canal, which is now called the Caldon Canal, at Froghall, to or near the town of Uttoxeter, which will open an easy conveyance for coals, lime, and other articles, between the two first-mentioned canals and the said town and neighbourhood; and that another canal may be made from out of the said Caldon canal at Shelton, to or near Cobridge, and another navigable canal out of the Trent and Mersey canal at Longport, to a place called Dale Hall, in Burslem in the said county, which last-mentioned canals will facilitate the conveyance of goods and merchandise between the canals of the company and the manufactories of earthen-ware in those neighbourhoods, and will be of public utility: It is therefore enacted, that the company may make and maintain a canal out of the Caldon canal at Froghall, to or near the town of Uttoxeter; and another canal out of the said canal at Shelton, to or near Cobridge; and another canal out of the Trent and Mersey canal at Longport, to Dale Hall in Burslem, with all necessary towing-paths, wharfs, and other conveniences, and do all

things necessary for making, using, and maintaining the canals and works. Plans and books of reference are left with the clerk of the peace for the county of Stafford, and the clerk of the company; and the course of the canals shall not deviate therefrom without the consent of the land-owners. No water to be taken for the use of these canals from the rivers Churnet or Dove, or out of any brook or rivulet which now falls into them. And this shall be allowed a public act.

N. B. The company being proprietors of the canals adjoining, few private clauses were wanted to secure private property, but what was wanted has been attended to. The usual navigation clauses are few, although there are three new branches of canals to make, and as no mention is made to raise money, it is to be presumed it is already in hand. The tonnage and wharfage of goods are very reasonable.

KENNET AND AVON CANAL, TO EXTEND AND  
AMEND. 1798.

The preamble states, that an act passed in 34 Geo. III. for making a navigable canal from the river Kennet, at or near Newbury, to the river Avon, at or near the city of Bath, and also certain navigable cuts therein described, and certain persons were incorporated by the name of The Company of Proprietors of the Kennet and Avon Canal Navigation; and another act was passed in the 36 Geo. III. to vary and alter the line of the canal authorised to be made by the former act: and the company finding other variations necessary, it is enacted, that immediately after passing this act, the company may vary and alter the line of the said Kennet and Avon

canal, from out of a piece of land in the parish of Bishop Cannings, in Wiltshire, to and near the west gate of Devises, and in a more direct line out of the canal near to Bathampton to the city of Bath, through the parishes of Bathampton, Bathwick, and Lyncombe, and Widcombe, in the county of Somerset, into the river Avon, at or near Dole Mead, and also to make a basin adjoining the said canal in the parish of Lyncombe and Widcombe.

Levels and surveys have been taken, and plans, with a book of reference, are deposited with the clerk of the peace for Wiltshire, and with the clerk of the company, and no variation or alteration shall deviate more than 100 yards from the plan and book of reference. And the company are authorised to make, erect, build, and execute all works, matters, and things, as shall be requisite and convenient, such as bridges, reservoirs, feeders, shafts, locks, tunnels, aqueducts, wharfs, quays, landing-places, weigh-beams, cranes, engines, machines, and all other things that may be found necessary for the use of the said canal navigation. And this is deemed a public act.

N. B. There are several clauses to secure private property in this short bill of variation, (which is certainly much better for the canal than the former line) especially protecting the springs at Sydney's Gardens, at Bathwick, as also empowering the company to purchase shares of the Kennet and Avon canal, between Bath and Hannaur Mills, of certain discontented persons; the usual clauses in all navigation acts are also inserted.

## NEWCASTLE-UNDER-LYNE JUNCTION CANAL.

1798.

The preamble sets forth, that the making and maintaining of a canal, or canal and inclined plane or rail-way, for the passage of boats and other vessels, and waggons and other carriages from and out of the Newcastle-under-Lyne canal, to the canal of Sir Nigel Bowyer Gresley, bart. and also another branch of canal or inclined plane or rail-way out of the last-mentioned canal at or near Apedale, to the coal and other works of Sir John Edensor Heathcote, knight, and Thomas Kinnersly, esq. at Partridge Nest, and John Wedgwood, gent. at Bignal End, in the county of Stafford, will be of great public utility, by opening an easy communication with several valuable mines and iron-works, and by furnishing, at an easy expense, the neighbourhood with coals, lime, and other articles : It is enacted, that (here follow the names of the company of proprietors) their heirs and successors, are united into a company and body corporate, by the style of The Newcastle-under-Lyne Junction Canal Company, who are hereby authorised to make, complete, or to alter a communication, by canal, or canal and inclined plane or rail-way, from out of the said Newcastle-under-Lyne canal, to the canal of Sir Nigel Bowyer Gresley, bart. near the town of Newcastle-under-Lyne, Staffordshire, and a branch of canal or inclined plane or rail-way out of the last-mentioned canal near Apedale as aforesaid, to the coal and other works at Partridge Nest and Bignal End aforesaid, and to supply the canal with water from all such brooks, springs, streams, rivulets, waters, and water courses as shall be found in dig-

ging or making the canal, or within 1,000 yards of the same, and to erect fire-engines or other machines for supplying the said canal with water, and for the use of the inclined plane or rail-way; and also may make soughs, tunnels, feeders, aqueducts, and channels, bridges, piers, arches, sluices, locks, flood-gates, weirs, dams, wharfs, quays, warehouses, toll-houses, landing-places, weighing-beams, cranes, dry docks, wet docks, pens for water, towing-paths, banks, ways, roads, and conveniences, where the company shall think proper and convenient, for carrying and conveying on the said canals stones, coals, minerals, goods, wares, merchandise, and other articles, not injuring the canal of Sir Nigel Bowyer Gresley, bart. A plan and book of reference are deposited with the town clerk of Newcastle-under-Lyne, and another with the clerk of the company, which shall not be deviated from without the consent of the land-owners; and the breadth of the canal, with the towing-paths, banks, drains, ditches, and fences, shall not exceed 26 yards, except where there are docks, basins, or pens of water, or where the canal shall be raised higher or cut more than five feet below the present surface of land, or where boats, barges, or other vessels turn, lie, or pass each other, or where wharfs, cranes, warehouses, or weighing-beams may be erected for the reception or delivery of coals, lime, lime-stone, timber, minerals, goods, wares, and merchandise, and not above 60 yards in breadth at any place without the consent of the land-owner.

The company are empowered to raise among themselves any sum of money to make and complete the said canal, inclined planes, or rail-ways, not exceeding 8,000 *l.* to be divided into 160 shares, of 50 *l.* each,

and shall be deemed personal estate ; every share to have one vote, but no person to have above 14 votes by personal attendance or proxy ; and in case the said sum of 8,000 *l.* should be insufficient, the company may raise 4,000 *l.* more, either by themselves or by admitting new subscribers, or on mortgage, but no mortgagee to have a vote on account of his mortgage.

Owners or occupiers of lands adjoining the canal may use pleasure boats, but not to pass through any lock unless they pay equal to a boat of six tons, nor to be used or carry any goods whatever, nor persons for hire, nor to any market, nor to obstruct the navigation. And this to be deemed a public act.

N. B. Although this is but a short navigable canal, the clauses securing private property, and what are usual in all navigation acts, amount to 90, many of which appear useless, except for lengthening the bill.

NEATH CANAL NAVIGATION, TO AMEND. 1798.

The preamble states and recites an act of 31 Geo. III. for making and maintaining a navigable canal from or near Abernant, in Glamorganshire, to and through the brick field near Halyn Crythan Pill, into the river Neath, near the town of Neath in the same county ; several persons therein named were united and made one body politic and corporate, by the name of The Company of Proprietors of the Neath Canal Navigation, and were authorised to make the said canal and the several works relating thereto, and to raise 35,000 *l.* to defray the expenses thereof, and the proprietors have nearly completed the same to the extent of the said recited act ; and



whereas, by surveys lately made, it appears that the said canal may be extended near the town of Neath into the river Neath, at a place called Giants Grave Pill, in the parish of Briton Ferry in the said county, and that such extension of canal will render it more convenient and useful, and be of public utility; and the said company are willing and desirous at their own expense to make, complete, and maintain the said extension, but cannot without the authority of parliament: Therefore be it enacted, that from the passing of this act it shall be lawful for the said company of proprietors to cause the said extension of the said navigation to be carried on and completed, and to defray the expenses already incurred, and which shall be incurred on account thereof, out of the money to arise by virtue of the said recited act; and which extension shall be considered and taken as part of the said canal; and the company may make and maintain any roads, rail-ways, waggon ways, inclined planes, bridges, or cuts to communicate therewith, and for making and erecting towing-paths, wharfs, warehouses, and all other works which may be useful and necessary.

And the company may, with the consent of the land-owners and occupiers, cut through and make a navigable canal, with towing-paths, rail-ways, and waggon-ways thereto, from the said canal, to any place within the distance of four miles from any part of the canal; and such cut or cuts when made and completed, shall be deemed and taken as parts of the said canal, for and in respect of paying the rates thereon, and for every other use and purpose of the said recited act and this act.

And the charge of warehouse-room for any goods, wares, or merchandise, in any warehouse erected by the said company, shall always be regulated by the charges made for warehouse-room of the like goods, wares, and merchandise at the warehouses of the Staffordshire and Worcester canal, at Stourport, in the county of Worcester. And this shall be taken and deemed a public act.

N. B. There are as usual several clauses to secure private property, and the usual ones in all navigation acts; and the produce of the vicinity of the canal being coal, culm, iron-stone, iron-ore, lead-ore, and timber, all heavy articles which would have lain useless in the bowels of the earth if not brought forward by so easy and cheap a carriage as canal navigation, we may venture safely to pronounce it a profitable and useful undertaking.

**WORCESTER AND BIRMINGHAM CANAL, TO AMEND.**  
1798.

The preamble states, that an act was passed in the 31 Geo. III. cap. 59, for making and maintaining a navigable canal from or near the town of Birmingham, in Warwickshire, to communicate with the river Severn near to the city of Worcester, whereby several persons were united and made a body politic and corporate, by the name of The Company of Proprietors of the Worcester and Birmingham Canal Navigation, with powers to make and maintain the same; and they were authorised to raise by contribution among themselves, or by mortgage, two sums of 180,000 *l.* and 70,000 *l.* as in the act is particularly mentioned, for defraying the expenses of the said undertaking; and the com-

pany have made and completed a great part of the said canal, and have expended a very large sum of money thereon, but find it will require a greater sum than they are authorised to raise to enable them to finish and complete the said canal : Be it enacted, that the company of proprietors be authorised to raise by subscription among themselves, or by the admission of new subscribers, or by mortgage or annuities, the sum of 149,929 *l.* 1*s.* 1¼*d.* more to be divided into 2,159 half shares, at 69 *l.* 8*s.* 10¼*d.* each, (if subscribed for) which half shares shall be deemed personal estate, and be transmissible as such ; and that two such half shares shall have a vote, either personally or by proxy ; and a proprietor may hold any number of shares or half shares he may think proper. And this shall be taken and deemed a public act.

N. B. The clauses for securing private property are as usual pretty numerous, and the intersecting and interfering with the Dudley canal, the Stratford and Avon canal, and the other canals, makes the description of them very complex, and almost unintelligible, unless to those locally concerned, and the difference of rates and tonnage out of one canal into another, and from that canal to another, perplexes but not explains its true meaning ; but as such an immense sum as 399,929 *l.* 1*s.* 1¼*d.* is raised to cut a canal, we must suppose it to be of vast consequence and utility, and a wonderful trade must be carried on to pay the interest : but the wonder will cease when it is considered for a moment that it is in the centre of the kingdom, and the centre of all our manufactures, and communicates with the four great sea ports London, Bristol, Liverpool, and Hull. The usual navigation clauses are also inserted.

MANCHESTER AND OLDHAM CANAL, TO AMEND.  
1798.

The preamble states, that an act passed in the 32 Geo. III. for making a navigable canal from Manchester to or near Ashton-under-Lyne, and Oldham in Lancashire; certain persons and their successors were incorporated by the name of The Company of Proprietors of the Canal Navigation from Manchester to Ashton-under-Lyne and Oldham; they were authorised to make, complete, and maintain a canal navigation from the town of Manchester, to or near Fairfield, and from thence one branch through part of the said parish and the parish of Ashton-under-Lyne, to a public highway in the town of Ashton-under-Lyne, to a bridge called Dukinfield bridge; and by another branch from Fairfield, to a place called New Mill, near the town of Oldham, and also to make an aqueduct bridge over the river Tame, at or near Walk Mill, near the town of Ashton-under-Lyne aforesaid, into Dukinfield, from and to communicate with the said canal; and another aqueduct bridge over the river Medlock, to a place called Boodle Wood; and to raise for the same 60,000 *l.* and if that is insufficient they may raise 30,000 *l.* more. And whereas a recited act of 33 Geo. III. enables the company of Manchester to Ashton-under-Lyne and Oldham canal to extend the same to a place called Clayton Demesne, in the township of Droylsden, in the parish of Manchester, to a place in the turnpike road in Heaton Norris, between Manchester and Stockport, at the Three Boars' Heads, and from a place called Taylor's Barn, in the township of Reddish, to Denton, at a place called Beat

Bank, adjoining the turnpike road between Stockport and Ashton-under-Lyne; and also from the intended aqueduct bridge at a place called Waterhouses, and to a place called Stake Leach, at Hollingwood, in the township of Oldham aforesaid; the said company were authorised to make, complete, and maintain a canal, navigable and passable for boats, barges, and other vessels, from Manchester, Ashton-under-Lyne, and Oldham canal, at Clayton Demesne, in Droylsden, to Heaton Norris, between Manchester and Stockport, by the Three Boars' Heads as before described; and another canal to communicate with the last mentioned from Taylor's Barn, in Reddish, to Denton, at Beat Bank, between Stockport and Ashton-under-Lyne; and also another canal to communicate with the aqueduct bridge at Waterhouses, to Stake Leach, at Hollingwood, in Oldham aforesaid; and to raise any money to defray the expenses thereof, not exceeding 30,000*l.* And the company have proceeded in making and completing parts of the said canals and works, and have not only expended the said money so raised; but are considerably in debt, and it is therefore absolutely necessary they should be authorised to raise a further sum of money, the powers of the recited act being defective and require amendment: Be it therefore enacted, that the company be authorised to raise any sum not exceeding in the whole 30,000*l.* over and above the sums of 60,000*l.* 30,000*l.* and 30,000*l.* in the said acts authorised to be raised as therein mentioned, either by mortgage, bonds, or promissory notes, payable in five years, which notes may be made stock of at the option of the note-holders, and then become joint proprietors in the whole canal

navigation, all its branches and extensions, and vote and receive the profits accordingly as an original proprietor. This to be taken and deemed a public act.

N. B. The clauses to secure the private property where it clashes and interferes with these several canals and their branches are rather numerous, but not more than were absolutely necessary; the clauses, as usual in all navigation acts, are nearly the same, and the vast sums of money raised to carry them into execution and completion proves their utility and prosperous situation. The country all around abounds with manufactures and manufacturers, who like swarms of bees are continually employed by the merchants, who, with a ready conveyance to the four great sea-ports, diffuse these productions over the whole globe.

STAINWORTH AND KEADLY CANAL, TO AMEND.

1798.

The preamble states, that by an act of 33 Geo. III. cap. 117, for making and maintaining a navigable canal from the river Dunn, at or near Stainforth, Yorkshire, to join the river Trent at Keadly, in Lincolnshire, and a collateral cut from the said canal to join the river Dunn, in the parish of Thorne, in the West-Riding of Yorkshire; certain persons therein named and their successors were incorporated by the name of the Company of Proprietors of the Stainforth and Keadly Canal Navigation, with powers to make a canal navigable for boats, barges, and other vessels, from the river Dunn navigation, cut near Stainforth to Keadly aforesaid, there to join with the river Trent in the line of direction marked out

in a plan and book of reference deposited with the clerk of the peace for the division of Lindsey, West-Riding, Yorkshire, and also to make a collateral cut from the said canal on Thorne Common to Hangman's Hill, there to join the river Dunn. The said company by the recited act were empowered to raise 21,200*l.* for to make the said canal and collateral cut; and if the said sum should be found insufficient they were empowered to raise 12,100*l.* more, either among themselves or by mortgage; and great progress hath been already made by the company in the execution of the said act, and they have already nearly expended the 24,200*l.* and have occasion for a larger sum than they have by the recited act a power to raise, for completing and finishing the works of the undertaking: be it enacted, that from and after the passing of this act, and the part of the recited act as enables the company to raise 12,100*l.* that instead thereof they may be authorised to raise 20,000*l.* and the money to be raised is to be laid out and applied to making, completing, and maintaining the said canal, collateral cut, side drains, banks, and other necessary works of the undertaking, according to the directions of the said recited act.

And if the said 20,000*l.* should be found insufficient, the company may raise 10,000*l.* more by mortgage, or otherwise, and the subscribers and proprietors are empowered to hold any number of shares, and to vote by himself, or herself, or by proxy, for every share. And this is deemed a public act.

N. B. The clauses to secure private property are but few, they being before taken care of in the

recited act, and the other clauses are as usual in all navigation acts.

**GRAND JUNCTION CANAL, NEW ARTICLES. 1798.**

This scarcely deserves mentioning, being only articles of agreement to explain the last act, that the company of the Grand Junction canal are empowered to purchase, if wanted, of the Bishop of London, Sir John Frederick, Sir John Morshead, Thomas Wood, Arthur Stanhope, and Robert Thistlewaite, esq. lands, for the use of the canal and conveniences necessary thereto.

**OXFORD CANAL, TO AMEND. 1799.**

The preamble states, that several acts passed in the 9th, 15th, 26th, and 34th years of Geo. III. for making a navigable canal from the Coventry canal navigation to the city of Oxford; certain persons therein named and their successors were incorporated by the name of the Company of Proprietors of the Oxford Canal Navigation, and have long since made and completed the said canal near to a certain place within the city of Oxford called Badcock's Garden, where it is proposed the said canal shall terminate; and in order to prevent any doubts or disputes that may arise respecting the authority of the said company of proprietors under the said acts, to carry the said canal beyond the north boundary of the said city, and it having been found that the said acts are in respects defective, and further powers being wanted to enable the said company of proprietors more effectually to support and maintain the said navigation; be it enacted, that from and after the passing of this act, the termination of the said



canal shall be deemed and taken to be at the said place called Badcock's Garden; and the powers and authorities of the said company shall extend to such part of the said canal as lies between the north boundary of the said city and Badcock's Garden, as fully and effectually, to all intents and purposes, as if the said termination had been particularly mentioned and described in the said recited acts, or any of them. And that all locks, quays, and other works, the dwelling-house and close in the occupation of James Dunsford, gent. clerk to the said company, and all houses, wharfs, warehouses, and other buildings which have been erected or purchased for the said company, or shall hereafter be erected or purchased for the said company, upon such part of the said canal or near adjoining thereto, shall be deemed and taken to belong to the said canal navigation, and be considered as a part thereof.

And it is also further enacted, that from henceforth 100*l.* stock in the said canal shall be deemed and taken as one share, and have one vote personally or by proxy, but no person to vote for more than 20 shares. And this shall be taken and deemed a public act.

**STRATFORD-UPON-AVON CANAL, TO AMEND. 1799.**

The preamble to the bill states, that an act passed 33 Geo. III. whereby certain persons were united and made one body politic and corporate, by the name and style of the Company of Proprietors of the Stratford-upon-Avon Canal Navigation, for making the same, and collateral cuts, and the several other works necessary for carrying the said act into execution; and the said company are directed to

make the said canal in such a line as is described and set forth in a plan and book of reference deposited with the clerks of Worcester and Warwick counties; and by another act of 35 Geo. III. the said company are authorised to make a navigable cut from out of the Stratford-upon-Avon canal, in the parish of Lapworth, into the Warwick and Birmingham canal, in the manor of Kingswood in Warwickshire, in such line as is set forth in a book of reference deposited as aforesaid; and the said company was authorised to raise by themselves, or on mortgage, certain sums of money therein mentioned for defraying the expenses of the said undertaking.

And the said company have made and completed a very considerable part of the said canal, but find it will require a greater sum of money than they are authorised to raise to enable them to finish the same, and to make and complete the collateral cuts, and also the cut into the Warwick and Birmingham canal and other works corresponding thereto, and it is necessary that some amendments should be made to the said acts; and upon a re-survey of the country through which the company are empowered to make some parts of the canal as yet unfinished, and also to make the cut into the Warwick and Birmingham canal, that it will be more convenient for the navigation and the public to vary the lines as hereafter mentioned, and also that it will be a further advantage to the public if the company are empowered to make a branch from out of the said canal, in the parish of Ashton Cantloe, as hereinafter mentioned: Therefore be it enacted, That from and after the passing of this act, it shall be lawful for the said company to vary and deviate from the lines described

in the plans and books of reference as aforementioned; within the several parishes of Lapworth, Kingswood, Rowington, Claverdon, Preston Bagot Bearly, and Ashton Cantloe in Warwickshire, and instead of making the said canal and the cuts in the said parishes according to the plans and books of reference before mentioned; but according to what is hereafter mentioned; and also to make a navigable branch out of the said canal from a close of land in the parish of Ashton Cantloe, in Warwickshire, to the Birmingham and Stratford turnpike road, according to the plan and book of reference; but the company may make variations between the intended cut into the Warwick and Birmingham canal and lands in the parish of Lapworth, to deviate not more than 100 yards from the said direction on the side thereof towards and in the parish of Rowington.

The company of proprietors are, by this amended act, authorised to raise among themselves, or by admission of new subscribers, or by bonds, mortgage, or annuities, 45,000*l.* (including 10,000*l.* authorised to be raised by the act 35 Geo. III.) to complete the said canal, cut, and branch, and other works authorised to be made by the said recited act. And this shall be taken and deemed a public act.

N. B. There is great care taken in this act to secure private property, and what with the cut and branch, with the junction into the Warwick and Birmingham canal, it is so complicated as hardly to be expressed intelligibly; there appear so many plans, maps, and books of reference which are not to be deviated from, to amuse the people for the moment. But when solicitor, surveyor, or engineer wants a job, the farce begins again, and a re-survey is made

with a few interested proprietors and solicitors' assistance, to increase tautology, and enlarge the expence of another application to parliament. The engineer and surveyor now must draw fresh plans and maps, with books of reference, not to be deviated from, till something else occurs to repeat it again, without deviation or variation; and then, to cover all blunders, "Errors in describing the line in the map or plan not to prevent the making the canal."

"What! after six plans and six books of reference, and three applications to parliament for money in addition, and 35,000*l.* to complete what the first estimate should have completed!—It was not so with my old master Brindley."

A company of gentlemen, by the allurements held out to them by an estimate to become joint proprietors in cutting a canal, in expectation of making 8 or 10 per cent. of their money, are often glad to sit down with 2½ or 3 per cent. and after an extra expense of tonnage on their goods.

#### TUNNEL UNDER THE THAMES FROM GRAVESEND TO TILBURY. 1799.

Although I deviate in this one instance from my original plan in mentioning canals only, yet I hope the novelty of this scheme will excuse me to the reader to mention it in as concise a manner as possible, it being a very long act, containing 65 clauses.

The preamble states, that the making of a tunnel or road under the river Thames, of a proper breadth for the passage of cattle and carriages, from near Gravesend in Kent, to near Tilbury Fort in Essex, would be of the greatest advantage to those counties, and would also be of great

national advantage as a military road or pass; but the same cannot be effected without the authority of parliament: Be it therefore enacted, That (here follow the names of the company of proprietors) shall for that purpose be one body politic and corporate, by the name and style of the Company of Proprietors of the Tunnel under the river Thames.

That it shall be lawful for the said company to raise and contribute among themselves 30,000*l.* for making and maintaining the said tunnel; and all the aqueducts, ways, road, engines, and all other works and conveniences belonging or requisite thereto, and the same to be divided into shares of 100*l.* each, and to be deemed personal estate, and every person having a share to vote personally or by proxy, but not exceeding ten votes in the whole to one person; and if the above sum is insufficient they may raise a further sum of 20,000*l.* either by themselves or by new subscribers of 100*l.* each share, who shall have the same vote personally or by proxy as the original subscribers, and if not raised in that manner, it may be raised by mortgage.

And the company are authorised to make and maintain a tunnel or road under the river Thames, from any point between 100 yards west of a house occupied by Jeremiah Howard, in the parish of Northfleet, and one quarter of a mile eastward of the New Tavern Bridge, in the parish of Milton next Gravesend, in the county of Kent, and between the opposite points on the shore in the county of Essex; and the said company may bore, dig, cut, trench, sough, get, remove, take, and carry away, lay, make use of, dispose of, and sell, for their own use and benefit, any earth, clay, chalk, stone, soil,

rubbish, trees, roots of trees, gravel, sand, or any other matters or things which may be dug or got in making the said intended tunnel, or other works thereto requisite to be done; and may also build and erect so many tunnels, aqueducts, water stanks, dams, drains, quays, houses, warehouses, toll-houses, watch-houses, landing places, weighing beams, cranes, fire-engines, or other machines, and other works, ways, roads, and conveniences as and where the said company shall think requisite and convenient.

And the said company may ask, demand, take, and recover for their own use the tolls following: that is to say—

|                                                                                                                         | s. | d. |
|-------------------------------------------------------------------------------------------------------------------------|----|----|
| For every wheel on every coach, chariot, landau, berlin, chaise, calash, curricle, or chair. ....                       | 2  | 6  |
| For every wheel on every waggon, wain, or cart .....                                                                    | 1  | 0  |
| For every horse, mare, gelding, or mule. .                                                                              | 1  | 0  |
| For every ass .....                                                                                                     | 0  | 3  |
| For every drove of oxen, cows, or neat cattle, per score .....                                                          | 15 | 0  |
| For every drove of calves, swine, sheep, or lambs, per score .....                                                      | 3  | 4  |
| For every drove of geese and turkies, per score. ....                                                                   | 0  | 2½ |
| For every foot pessenger .....                                                                                          | 0  | 2  |
| No toll to be taken for any beast that draws a wheel carriage, or for one person attending a cart or two with a waggon, |    |    |

No toll to be demanded or taken of any officer or soldier upon march, or upon duty, or for any horse belonging to any officer or soldier upon march or duty, or

for any horse, cattle, or carriage conveying arms or baggage, or sick, wounded, or disabled officer or soldier, or in conveying cannon, ordnance, or military stores, or any horse, mare, or gelding furnished by or for any person in any corps or troop of volunteer cavalry, rode by them in uniform, going or returning from exercise; and in consideration of such exemptions, the lords commissioners of the treasury shall pay yearly and each year the clear sum of 1000*l.* in four equal quarterly payments; and if the said sum of 1000*l.* is not paid as aforesaid, the company are empowered to take the usual tolls of men, horses, carriages, &c. &c.

The tunnel to be lighted with as many lamps as the company of proprietors may think proper, and if wilfully broke or damaged 20*s.* penalty or one month to hard labour in the common gaol or house of correction. No passage through the tunnel at any other time than between the hours of 7 in the morning and 5 in the evening in November, December, January, and February; between 5 in the morning and 8 in the evening during the months of March, April, September, and October; and between 4 in the morning and 9 in the evening in May, June, July, and August, in every year. And his Majesty, in right of his crown, having a right to the accustomed ferry over the river Thames, the company are required to pay unto his Majesty, his heirs, and successors, a rent of 80*l.* yearly, and every year, by two equal half yearly payments, as a recompense and satisfaction for the said ferry, houses, and buildings thereto belonging; and the corporation of Gravesend and Milton are in right of their estates, entitled to a certain and accustomed ferry

over the said river Thames, now let at 30% a year, and the profits and emoluments thereof will be considerably diminished, if not wholly taken away, by making the said tunnel near to the said ferry; the company therefore agrees to pay to the said corporation of Gravesend and Milton a like rent of 30% a year, and every year, by two half yearly payments, as a full recompense and satisfaction for the said ferry, or the said company may contract and make an absolute purchase of the said ferry, reckoning the value thereof at 30% a year; and all acts or offences done within the tunnel or any part thereof shall be deemed to be done in either of the counties of Essex or Kent, and all actions may be brought, laid, tried, and prosecuted in either county of Essex or Kent. And this shall be taken and deemed a public act.

N. B. I must beg leave to animadvert a little, and make a few remarks on this novel piece of business, and consider its expense and utility.

Mr. R. Dodd the projector, and who calls himself a civil engineer, confesses he took the first hint of this scheme by observing the souterrain or tunnel intended to be performed between North and South Shields near the mouth of the river Tyne, which will save a circuit of 20 miles, and formed the idea of a like accommodation between Kent and Essex at Gravesend to Tilbury on the Essex shore, which will save a circuit of 50 miles in going round over London bridge. This was supposed to be practicable, from a supposition that a bed or rock of chalk was supposed to pass under the whole bed of the river into the Essex marshes; but I think Mr. D. will be greatly mistaken, for



several reasons, which shall be hereafter mentioned ; and, if he had acted as caution should have dictated, he would have made himself well acquainted and complete master of all expected difficulties, as well as of the favourable circumstances.

The foundation of Tilbury fort when erected, was about 48 feet below the then surface, and all soft clay ooze, and there appeared flags, rushes, sedges, leaves, branches of trees, holly trees, &c. &c. all laid flat, which proved it to have been occasioned by a sudden inundation ; below this was a quicksand, which appeared to have been the original shore of the river. Then they bored 30 feet deeper, making it 78 feet, in order to find fresh water to accommodate the garrison by two wells ; at this last extremity they found a fine stiff marl. The first question is, what depth from this marl or clay must the tunnel be made ; this being 78 feet, and the depth of the river at spring tides 66 feet ? The marl or clay continued only 2 feet deeper, and then appeared a layer of chalk. This is now 80 feet from the surface of the parade, and consequently above the same depth from high water mark. How deep this chalk layer runs I know not ; but I should suppose that it runs as all chalk quarries or pits do : namely, a layer of about a foot of flint stones, called a belt, at about every four feet of chalk, and so on alternately, a layer of chalk of 4 feet, and a belt of flints of 1 foot or 15 inches, as may be seen in the pits at Northfleet, and any where else in the county where chalk pits are.

My readers I beg and hope will suffer me here to digress a little more, and to apprise Mr. D. of difficulties to be surmounted, and natural obstacles

arising that will require all his ingenuity and acuteness to encounter. We now call this 80 feet from the surface of high water mark; the top of the arch of the tunnel cannot be less than 30 feet below this; and if the tunnel be cylindrical it will take 20 feet more to the bottom of the tunnel, making it altogether 130 feet deep from the top of high water mark. I say and will prove that steam engines (for there must be more than one, although Mr. D. mentions one, *IF WANTED*) placed to discharge the water, not only from the work as carrying on, but kept continually at work to draw off the water which will weep, or rather copiously drain through the open pores of the belts of flint, as well as through the fissures and crevices of the chalk, besides what may be cut into and spring up, will also draw all the wells dry in Gravesend, and greatly affect, if not render entirely useless, the wells in the garrison at Tilbury fort, will destroy the tunnel (if ever made) and make the whole scheme abortive.

Now as I have supposed the tunnel's height to be 20 feet, to be completely useful it ought to be wide enough for two loaded waggons to pass each other, which cannot be less than 16 feet, and a foot-path of 4 feet on one side at least, which will be 20 feet, and will form a circle; but if a 4 feet foot-path on each side the better, and as the bottom must be filled up with stone and gravel, or paved, cannot be less than 5 feet, which will leave only 15 feet from the centre of the arch; then if 4 feet more is allowed to be squared from the top of the arch, it will leave only 11 feet, which is not high enough for a tilted waggon, or one loaded with hay or sheaves of corn.

Mr. D. proposes 16 feet diameter in the clear, and a road of four feet to be filled up near 16 feet wide, and the space above 12 feet is a sufficient width for foot, horse, and carriage passengers, (this I think common sense denies) and to be illuminated with lamps, and a steam engine to draw off the drainage waters, if necessary, (he has no occasion to say IF NECESSARY ! for he will find more than one or two to be necessary.) Now follows his estimate :

|                                                                                                                                         |          |
|-----------------------------------------------------------------------------------------------------------------------------------------|----------|
| 900 yards of running measure of tunneling, digging, and vaulting, with key-stones, (no size mentioned) at 12 <i>l.</i> per yard * . . . | £ 10,800 |
| Relaying the bottom with new-made ground, 900 yards, at 1 <i>l.</i> per yard . . . . .                                                  | 900      |
| Fixing lamps and irons through the tunnel, toll collector's room, gates, &c. . .                                                        | 400      |
| Making good entrance-roads at each end                                                                                                  | 160      |
| Steam-engine and pipes, IF NECESSARY                                                                                                    | 1,780    |
| Necessary machinery during the execution . . . . .                                                                                      | 500      |
| Ten per cent. on the whole for contingencies . . . . .                                                                                  | 1,455    |
|                                                                                                                                         | <hr/>    |
|                                                                                                                                         | £ 15,995 |

As the estimate is not 16,000 *l.* why raise 50,000 *l.* in the act granted by parliament, or why make any estimate for less than one third of what it will cost ?

\* I was at the digging and vaulting the first tunnel that ever was performed in this country, invented by my old master Mr. Brindley, through Harecastle, in Staffordshire, in 1776, and which cost only 3*l.* 10*s.* 8*d.* per yard, and that was thought a great sum of money.

The tunnel at Sapperton, to join the Thames and the Severn,

## THAMES AND MEDWAY CANAL. 1800.

The preamble states, that the making and maintaining a navigable canal for boats, barges, and other vessels from the river Thames, near Gravesend, in Kent, to the river Medway, at or near a place called Nicholson's Ship Yard, in Frindsbury parish and county aforesaid, and the making a collateral cut from the said canal at a place called White Wall, in the said parish of Frindsbury, to the river Medway, nearly opposite his Majesty's dock yards at Chatham, will greatly facilitate and render less expensive the carriage and conveyance of coals, timber, stone, corn, lime, and manure, as also of all goods, wares, and other articles, and will considerably improve the agriculture of the country, and will render unnecessary a long and circuitous and sometimes dangerous navigation on the open sea, and will otherwise be of great public and private advantage; but the same cannot be effected without the authority of parliament: Be it therefore enacted, by the authority

through two miles of solid rock, cost only about eight guineas per yard.

Mr. D. calculates, or rather estimates, selling the chalk at 2s. 6d. per yard cube, and the flints at 10s. to 15s. but seems regardless of the great drainage water that constantly and inevitably drains through the pores of the belts of flints, and the fissures and crevices in the small bodies of chalk, which do not lie close together like a body of stone or clay; and all this to be finished in 12 months! It is now almost four years since the act passed, and three since it began, but the progress is so small, that if it does not go on a little faster, neither Mr. D. nor his son will live to see it finished. It was a job from the beginning, and will continue so; and if ever finished, will never pay one per cent. for the money advanced.

of the same, that (here follow the names of the company of proprietors) and their successors, shall be a body politic and corporate, by the name and style of The Company of Proprietors of the Thames and Medway Canal, and the company may raise and contribute among themselves a competent sum of money for making and maintaining the said canal and collateral cut, and all feeders, basins, aqueducts, ways, roads, bridges, quays, wharfs, and all other works and conveniences requisite thereto, not exceeding in the whole 40,000 *l.* which shall be divided into shares of 100 *l.* each, which shall be personal estate, and to have a vote for every share, but not to exceed five votes in the whole, although possessed of more than five shares, which votes may be given personally or by proxy; and in case the said sum of 40,000 *l.* shall be insufficient, the company may raise among themselves 20,000 *l.* more, to be divided into shares of 100 *l.* each as before; or it may be raised on mortgage, and six calendar months given to pay off any part of it, with five per cent. interest.

The company are empowered to make the said canal navigable for boats, barges and other vessels, from out of the river Thames on the east side of the town of Gravesend, in the county of Kent, through the several parishes, hamlets, or places of Milton, Denton, Chalk, Higham, Shorne, and Cliff, to the river Medway, at Nicholson's Ship Yard, all in the said county; and also to make a navigable cut from out of the said canal near a place called White Wall, in the parish of Frindsbury, into the river Medway, to a certain point nearly opposite his Majesty's dock yard at Chatham, and to supply the said canal and

cut with water from the rivers Thames and Medway, and from all rivers, brooks, springs, streams, rivulets, and water courses which shall be found in digging the same, or within 2,000 yards from the head level of the canal or cut, or any other part of them, and may make soughs, tunnels, feeders, aqueducts, and channels, as they may think proper for supplying the said canal and cut with water, as also a basin or basins within 150 yards on either side of the canal or cut, and also may build, erect, and set upon them, or the land adjoining, bridges, piers, arches, sluices, locks, flood gates, weirs, dams, drains, wharfs, quays, warehouses, toll-houses, watch-houses, landing-places, weighing-beams, cranes, fire-engines, or other machines, dry docks, or other works, ways, roads, and conveniencies, as where the company may think requisite; and may make towing-paths, banks, roads, and ways convenient for towing, hauling, or drawing boats, barges, or other vessels upon the said canal or collateral cut, with men, horses, or otherwise, with proper places for the said vessels to turn, lie, or pass each other, and may use rollers, inclined planes, rail-ways, waggon-ways, or cranes, or by any other manner than by or upon water.

The lands to be taken for the canal and collateral cut for towing-paths, ditches, drains, banks and fences, not to exceed 40 yards in breadth, except in such places where docks, basins, or pens of water shall be made, or where the canal or cut shall be raised higher or cut above 10 feet deeper than the present surface of the land, and also except in such places where the vessels turn, lie, or pass each other, or where engines, warehouses, cranes, or weighing-beams are erected, or where wharfs are made for receiving coals, lime,

lime-stone, minerals, timber, stone, or other goods, wares, and merchandise; and not more than five acres of land to be taken for any basin or pen of water, and which land for such basin or pen of water to be made at the three extremities of the canal and cut, namely, next Gravesend and the river Medway. A plan and book of reference of the line of the canal and cut are deposited with the clerks of the county and company, which are not to be deviated from above 150 yards. And if proper roads, bridges, stiles, gates, fording-places, watering-places, (for cattle) passages, arches, tunnels, drains, back drains, trenches, and other conveniencies for the use of the land-owner or occupier are not made by the company, the same may be made by the land-owner, and make the company pay the expense. And the land-owners through whose lands the canal or cut shall pass, shall have a right of fishery thereon as far as the bounds of those lands; and nothing in this act shall prejudice the right of the Lord Mayor and Citizens of London, or their successors, to diminish their power, authority, and jurisdiction, as conservator of the rivers Thames and Medway; and an acknowledgment for the company to pay the Mayor, Commonalty, and Citizens of London, the sum of one shilling, and no more, for ever, yearly, and every year, on the 24th day of June, if lawfully demanded. And the said company shall pay to the Mayor and Citizens of Rochester, in the county of Kent, as conservators of the river Medway, the sum of one shilling, and no more, for ever, yearly, and every year, on the 24th day of June, if lawfully demanded. And that no person or persons whatsoever shall lay any oysters or spatt of oysters, or dredge for or

take oysters in the said canal or collateral cut, or either of them, or any of the basins or other works thereto belonging; and the owners or occupiers of lands may use pleasure boats on the said canal and cut, so as not to be made use of to carry any goods or other things, nor pass through any lock, or prejudice the navigation, banks, towing-paths, or other works. And this shall be taken and deemed a public act.

N. B. This is a most voluminous act, containing 97 clauses, many of which are mere tautology, there being occasion for very few for securing private property, yet as many as are wanted; but the number of clauses usual in navigation acts are very much extended, and the rates of tonnage, wharfage, and tollage are long and particular. This canal may answer the purpose for government when at war, but never will for the purpose of trade, as barges would get to the mouth of the Medway by low water in the same tide that they must enter the canal at Gravesend, and be ready to go up to Chatham the beginning of the flood-tide, and be at Chatham by the time (or very near, and sometimes sooner) than a barge can go on the canal, without the additional expense of lock-dues, horses, and attendance in being drawn along, and this in most instances, except when it blows a gale of wind at east or north-east for a short time in winter: this is not my own opinion only, but, from inquiry I made of several barge-men and barge-masters at Maidstone and Rochester, I found it general.



**ASHTON-UNDER-LYNE, OLDHAM, AND MANCHESTER CANAL, TO AMEND AND EXTEND. 1800.**

The preamble states, that by an act of 32 Geo.

III. certain persons and their successors were incorporated by the name of The Company of Proprietors of the Canal Navigation from Manchester to near Ashton-under-Lyne and Oldham, and are authorised to make and complete a canal navigation from the town of Manchester at or near a street called Piccadilly, through a part of the parish of Manchester, near to Fairfield in the said parish, and by thence by one branch to Dunkinfield bridge, in the town of Ashton-under-Lyne, and by another branch from Fairfield to New Mill, near the town of Oldham; and also to make an aqueduct bridge over the river Thame, at Walk Mill, near the town of Ashton-under-Lyne aforesaid, into Dunkinfield, from and to communicate with the said canal; and another aqueduct bridge over the river Medlock, to communicate with the said canal at Boodle Wood, in the said parish of Ashton-under-Lyne, to raise 60,000 *l.* to defray the expense thereof; and if that sum was insufficient, they might raise 30,000*l.* more.

And by an act 33 Geo. III. the company of proprietors were enabled and authorised to extend the said canal from a place called Clayton Demesne, in the township of Droylston, in the parish of Manchester, to Heaton Norris, between Manchester and Stockport, opposite the Three Boars' Heads; and from Taylor's Barn, in the township of Reddish, to Denton, at a place called Beat Bank, adjoining the turnpike road between Stockport and Ashton-under-Lyne, and also from the intended aqueduct bridge

at Waterhouses, in Ashton-under-Lyne, to Stake Leach, at Hollingwood, in Oldham.

And by another act 38 Geo. III. the company was enabled to perform the above works at the several places aforesaid, and to grant further powers as is recited, and were empowered to raise the several sums of 60,000 *l.* and 30,000 *l.* and 30,000 *l.* and a further sum of 30,000 *l.* It is found that the remainder of the money cannot be raised by the means prescribed in the last act of 38 Geo. III. being defective. And the company have incurred sundry debts in the prosecution of the undertaking : Therefore be it enacted, that the company be empowered to raise the last mentioned sum of 30,000 *l.* being the same sum of 30,000 *l.* authorised to be raised by the said last recited act ; and if that sum should be found insufficient, by virtue of this act they are authorised to raise 20,000 *l.* more, either by subscription, bonds, notes, mortgage or annuity. And this shall be deemed a public act.

N. B. This amended act is so complicated, occasioned by the clauses for the joinings and intersections being intermixed with the other parts, that it is hardly intelligible.

#### ROCHDALE CANAL, TO VARY AND AMEND. 1800.

The preamble states, that by an act passed in the 34 Geo. III. certain persons were incorporated by the name of The Company of Proprietors of the Rochdale Canal, and were authorised to make and maintain a canal navigation from the Calder, otherwise Calder and Hebble navigation, at or near Sowerby bridge wharf, through or near Todmorden and Deyne

Head, in the parish of Rochdale, and near the town of Middleton, and through the parish of Prestwich-cum-Oldham, all in the county of Lancaster, to join and communicate with a canal of the Duke of Bridgewater, at or near Castlefield, in the parish of Manchester, and also to cut a navigable branch from the said canal at the village called Lower Place, in Castleton, in the parish of Rochdale, to a place called School Lane, in the township of Castleton; and also to make another cut to branch from the said canal at a place called Failsworth, in the parish of Manchester, to the north side of the new turnpike road leading from Manchester to Oldham, near to Hollingwood Chapel, in the county aforesaid, and to build and erect wharfs, warehouses, and all other works and conveniencies necessary to the said navigation. And the said company were empowered to raise, as in the recited act directed, 291,900 *l.* to be divided into shares of 100 *l.* each, and if that should be insufficient, they were empowered to raise 100,000 *l.* more, as therein expressed; and the company have proceeded in making the said canal, cuts, and works, and have expended the whole of the 291,900 *l.* but are still indebted to a large amount for lands marked out for the canal, cuts, and works, and for goods, utensils, and implements for the use of carrying on the works; and much more expense hath been and will be incurred in completing the undertaking than was estimated when the rates of tonnage granted by the act were fixed and settled; it is therefore reasonable that the company should be empowered to take some additional rates of tonnage towards answering the excess of expense.

The company have found that a deviation is absolutely necessary from the original line of canal as laid down in the plan and book of reference in two several parts thereof which have not begun to be cut or made, namely, that one of such deviations should commence at a place called Gorell's, in the township of Castleton, Hopwood, Thornham, Middleton, and Chadderton, in the parish of Prestwich-cum-Oldham, in the said county of Lancaster, to communicate again at or near where the same passes Chadderton Brook; and the other deviation from the north side of the sign of the Packhorse, at Failsworth, through Failsworth Newton and Manchester, and county aforesaid, to communicate again with the old line of canal at Butler's Lane, in the township of Manchester; and a plan of the said deviation, and the book of reference, are deposited as before; and the company engage in nowise to deviate more than 50 yards from the new line laid down from Gorell's to Chadderton Brook, and from the Packhorse to Butler's Lane; and to enable the company to raise the last sum of money, and to complete their canal, cuts, and branches, and pay off all incumbrances, they are authorised to raise their rates of tonnage one halfpenny per ton per mile, not passing through a lock, (even to lime, dung, and manure) and one penny per ton per mile on all goods, wares, and merchandise, timber and stone, lime, lime-stone, dung, manure, clay, sand, and gravel, which pass through any lock, and allow only 30 feet cube of round or square timber to be one ton. And this is to be deemed a public act.

N. B. If we are to estimate the profits from the immense sum raised for completing this canal and

its branches, we may venture to pronounce it one of the first speculations in the kingdom; and although the navigation clauses are many, yet intersecting and joining different properties must be studiously adhered to; the clauses for securing private property are but few, but attended with necessary explanations.

DEARNE AND DOVE CANAL, TO AMEND. 1800.

The preamble states, that by an act 33 Geo. III. certain persons therein named, and their successors, were incorporated by the name of The Dearne and Dove Canal Company, with powers to make a canal navigable for boats, barges, and other vessels from the river Dun navigation cut, in the township of Swinton, in the parish of Wath, to or near the town of Barnsley, in the parish of Silkstone, and a collateral cut branching out of the said canal in the township of Worsbrough, to a close called the Holme; and also a collateral branch out of the said canal in the township of Wombwell, to a close called Cobcar Ing, in the township of Hoyland, all in the West Riding of the county of York, in such course and directions as are delineated and described in plans and a book of reference deposited with the clerks of the county and company; and the said company were empowered by the said recited act to raise 60,000 *l.* to complete the same, in shares of 100 *l.* each: and if that sum should be insufficient, they were authorised to raise 30,000 *l.* more, to be divided into half shares, and regulated to be raised, and power to vote personally or by proxy, as the said act expresses: And be it further enacted, that if the last-mentioned sum of 30,000 *l.* shall be found insufficient for completing the canal, collateral cuts,

and works, they are empowered to raise 10,000 *l.* more, either by subscription, mortgage, bond, note, or annuity, for the sole use of finishing and completing the undertaking, and to be used for no other purpose whatever.

And in consideration of the very great additional expense the said company have sustained and been put to in making and completing the said canal, and the several cuts and other works directed to be made by the said recited act, beyond what was estimated and proposed when the rates of tonnage and wharfage, craneage and portorage payable by the said recited act were settled and fixed; it is reasonable they should be authorised to collect some additional rates towards answering such additional expense: Be it therefore further enacted, that it shall be lawful for the said canal company (over and above what they are entitled to receive by virtue of the said recited act) to ask, demand, take, and recover for their own proper use and behoof, for the tonnage, wharfage, craneage, and portorage of all goods, wares, merchandise, coals, stone, timber, and other things that shall be navigated thereon, one moiety or half part of the rates and duties they now receive by virtue of the said recited act, but not on flag, paving stone, lime-stone, or lime, which shall have been previously navigated or brought up the Barnsley canal from Wakefield, to the junction of the said Barnsley canal with the Dearne and Dove canal, at or near Barnsley. And this shall be deemed a public act.

N. B. No doubt the company are well aware, while loading the tonnage one half or 50 *l.* per cent. on carriage, that it is able to bear it. The immense

sum of 100,000 *l.* laid out on a useful and public undertaking, it is to be hoped will be crowned with success to the company, who certainly calculated their advantages, but I trust with better success than their surveyor, who, if not assisted and authorised by parliament, after laying out and expending 60,000 *l.* was minus 40,000 *l.* two thirds more than the original estimate.

PEAKE FOREST CANAL, TO ALTER AND AMEND.  
1800.

The preamble states, that by an act passed in the 34 Geo. III. certain persons and their successors were incorporated by the name and style of The Company of Proprietors of the Peak Forest Canal, and are authorised to complete a navigable canal called the Peak Forest canal, from out of the canal from Manchester, near Ashton-under-Lyne and Oldham, in Lancashire, at the intended aqueduct bridge in Dunkinfield, in Cheshire, to or near Chappel Milton, and a communication by rail-ways or stone roads from thence to Loadsknowl, in the Peak Forest, both in Derbyshire; and also to make a navigable cut from out of the said intended canal in the township of Yeadsly Whaley, in the parish of Taxall, in Cheshire, called Bottom's Hall, to Whaley bridge, and to make and maintain such other rail-ways or stone roads as by the said act is authorised to be made, and to raise a sum of money for that purpose not exceeding 90,000 *l.* and if that sum should be found insufficient, to raise 60,000 *l.* more, to be divided into shares, and votes regulated as the said recited act expresses; and the company have expended in completing a great part of the said several

undertakings 117,140 *l.* and have incurred sundry debts which are yet unsatisfied, and the recited act is in some cases defective, and it is requisite it should be amended : Be it therefore enacted, that the company of proprietors may raise what money is wanted to liquidate the said debts, and to finish and complete the said canal, cuts, and rail-ways, and other works, either by creating new shares, or on notes, bonds, or mortgage, and in such manner as the committee or general assembly of the company shall think proper. And this shall be taken and deemed a public act.

N. B. This canal carries a very promising aspect ; and after expending near 150,000 *l.* which they were by the first act empowered to raise, the liberty given by this act of appropriating a further unlimited sum shews the confidence put in the company of proprietors, as well as in the success of the undertaking.

#### HUDDERSFIELD CANAL, TO AMEND. 1800.

The preamble states, that by an act passed in the 34 Geo. III. certain persons and their successors were incorporated by the name and style of The Huddersfield Canal Company, and were authorised to make and complete a canal to be called the Huddersfield canal, navigable for boats, barges, and other vessels, from and out of the canal of Sir John Ramsden, bart. at a place between the King's Mill and the town of Huddersfield, in the West Riding of Yorkshire, to join and communicate with the canal navigation from Manchester, to and near Ashton-under-Lyne and Oldham, in Lancashire, at the highway in the town of Aslton-under-Lyne aforesaid, near Dunkinfield bridge, and to raise among



themselves a competent sum of money for making and completing the same, and other works authorised to be made by the said act, not exceeding in the whole 184,000 *l.* (except as therein excepted) and if that sum should be found insufficient for making and completing the same, they were enabled to raise and contribute among themselves 90,000 *l.* more, or to raise it on bonds, notes, or mortgage : and whereas the whole of the sum of 184,000 *l.* was originally subscribed, but a very considerable deficiency in the payment thereof has been occasioned by the bankruptcy and insolvency of several of the subscribers thereto, and the whole of the subscription which the company have been able to recover, hath (together with the sum of 14,182 *l.* which is all the money the said company have been able to borrow on mortgage) been expended in the prosecution of the works of the said canal, and in carrying into effect the powers of the said act ; and doubts have arisen whether the said company are able, under the powers of the said act, to raise the sum of 90,000 *l.* or any part thereof, by calls from the respective proprietors of shares in the said Huddersfield canal ; and the said recited act hath in other things been found defective, and requires alteration and amendment : Be it therefore enacted, that the said company be authorised from time to time to make any call or calls for money from the proprietors, not exceeding 20 *l.* in the whole sum for every share for discharging the debts, and for finishing and completing the said canal and other works, as is recited in the said act.

And the said company are hereby authorised, in case they shall think proper, to raise any sum of

money that shall be found necessary for finishing, completing, and maintaining the said Huddersfield canal, and other works, that shall not exceed in the whole 274,000 *l.* being the amount of the two sums of 184,000 *l.* and 90,000 *l.* as by the recited act, or by creating new shares by virtue of this act, or by promissory notes payable at distant times, with lawful interest for the same; and every proprietor of a new-created share or shares in the said canal shall have a vote for every such share, not exceeding 10 votes personally, nor 10 other votes by proxy. And this to be deemed a public act.

N. B. The navigation clauses are very long and numerous, especially those to preserve the springs, brooks, and water courses that supply several mills, which this canal cuts in its progress. The wonderful sums of money raised for carrying on navigable canals is astonishing, but shews their utility, and also the richness of the country, for what in other countries in Europe that I have seen could not be effected, even with the assistance of government, is in England effected by a few obscure individuals, which proves that nothing is wanting to promote trade and commerce in this country.

LEICESTER AND MELTON MOWBRAY CANAL, TO  
AMEND. 1800.

The preamble states, that by an act of 31 Geo. III. cap. 89, certain persons therein named, and their successors, were incorporated by the style of The Company of Proprietors of the Navigation from the Leicester Navigation to Melton Mowbray in the county of Leicester, and are authorised and empowered to make and keep navigable the rivers Wreak

and Eye, in manner therein mentioned, and to raise any sum of money for the defraying the expense thereof, not exceeding 25,000 *l.* but if that sum should be found insufficient, they might raise a farther sum of 5,000 *l.* and in proceeding to complete the same, they have expended the two sums of 25,000 *l.* and 5,000 *l.* together with all the tolls and duties they have received since opening the said navigation; amounting to a farther sum of 7,000 *l.* and upwards; but have contracted debts to the amount of upwards of 4,000 *l.* and some of the works are still incomplete: Therefore be it enacted, that the company of proprietors be authorised to raise among themselves, according to their present shares, or by the admission of new subscribers, any sum not exceeding 10,000 *l.* and to have it divided into shares as the recited act specifies, and to have votes and proxies in the same manner as the original subscribers, or they may borrow it on mortgage.

And in consideration of the great additional expenses of the said company, beyond what was estimated when the rates of tonnage were settled and fixed by virtue of the said act, and the still further expense they will necessarily be put to in fully completing the said works, it is reasonable they should be authorised to collect some additional rates towards answering such additional expense: Be it therefore enacted, that from and after passing of this act, it shall be lawful for the company of proprietors to ask, demand, take, and receive for their own use and behoof as hereinafter mentioned, (here follows a long list of the advanced rates and tonnage to different places). And this shall be taken and deemed a public act.

N. B. As this canal interferes with the Oakham and other canals, care is taken to have several specific clauses to secure the rates of tonnage on each so as not to injure one another, and being only an amended act there are no more than the just and necessary clauses.

OAKHAM CANAL, TO ALTER AND AMEND. 1800.

The preamble states, that an act passed 33 Geo. III. whereby certain persons were incorporated by the name of the Company of Proprietors of the Oakham Canal, and were authorised to make a navigable canal from Nill-Close-Homestead, in the parish of Melton Mowbray, in Leicestershire, into Cutt's Close, in the parish of Oakham, in Rutlandshire, and to make and erect wharfs, warehouses, and other buildings and conveniences necessary to the navigation, and the company were authorised to raise among themselves 56,000*l.* and if that sum was insufficient the company were also empowered to raise a farther sum of 20,000*l.* on mortgage or other securities; and the company have proceeded in making and completing a great part of the canal and works, and have not only expended the whole of the 56,000*l.* (after deducting the calls and proportions of sundry persons who are become insolvent, or in arrear) but are indebted in considerable sums; and the company have not been able to borrow or raise any part of the sum of 20,000*l.* by the ways and means in the said act mentioned, and they are now unable to raise any further sum of money whatsoever, although about 10 miles of the line of the said canal out of 15 miles have been cut and completed; and whereas divers alterations and amendments in the act are

necessary, and further powers should be granted, wherefore be it enacted, that the said company of proprietors of the Oakham canal are hereby authorised to raise or borrow any further sum of money not exceeding 30,000*l.* (although the whole of the sums of 56,000*l.* and 20,000*l.* allowed to be raised by the recited act may not have been raised).

And it is hereby declared lawful for the said company or their committee to raise the sum of 30,000*l.* or such part thereof as they shall think fit, by creating such number of new or additional shares as they shall think requisite for that purpose; and they may also borrow money on bond or promissory notes if most ready and expedient; and the said company shall at all times take the additional tonnage payable on iron, timber, stone, or other goods, wares, and merchandise, as the company of the Leicester navigation to Melton Mowbray, which comes through the basin of the Oakham canal, by their last act are entitled to. And this is deemed a public act.

N. B. What private property clauses are inserted are but few, but wholly depend on securing the water in several springs and brooks belonging to the nobility in the neighbourhood. The other clauses as usual in navigation acts. The advance of tonnage will make a great addition in profit on this navigation. They are limited not to raise more than 86,000*l.* in the whole by virtue of both acts.

#### LANCASTER CANAL, TO COMPLETE. 1800.

The preamble sets forth, that by an act passed 32 Geo. III. certain persons therein named and their successors were incorporated by the name of the

Company of Proprietors of the Lancaster canal navigation, and were authorised to make and complete the said canal and branches, and the roads, ways and conveniences to the same belonging, and to raise a sum of money not exceeding 414,100*l.* and if that sum was found insufficient they might raise 200,000*l.* more, either among themselves or by admission of new subscribers, or by mortgage; and the said company have proceeded in making certain parts of the said canal in the county of Lancaster, and have not only expended the whole of the said sum of 414,100*l.* (after deducting the calls and proportions of sundry persons who are become insolvent and in arrear, and after reserving the sum of 60,000*l.* by the said act directed to be expended in making and completing the said canal in the county of Westmorland), but have borrowed and taken up at interest 37,804*l.* 5*s.* part of the said sum of 200,000*l.* And the said company have incurred sundry debts in the prosecution of the said undertaking which are yet unsatisfied. And whereas by another act 33 Geo. III. the said recited act was amended, and power given to make a branch from the said canal near a place called Galgate, through the townships of Ellel and Thurnham to communicate with the Dock at Glasson in the said county palatine; and more money than the company have yet been able to raise will be required to liquidate and discharge the debts of the company, and to finish and complete the canal, branches, and other works to be done: Therefore be it enacted, that the said company of proprietors be empowered to raise the said sum of 200,000*l.* or so much thereof as shall be necessary for making and completing the said canal navigation and works,

over and above the sum of 414,100*l.* in the first recited act mentioned, (although the last mentioned sum, by reason of the interest payable on sums subscribed, the arrears of calls of subscriptions, and the reserving the sum of 60,000*l.* may not have been wholly raised) and that the money to be raised by virtue of this act shall be applied in discharging the debts owing by the said company of proprietors, including the said sum of 37,804*l.* 5*s.* and such further debts as they may contract in the completing the said canal, cuts, and works thereto belonging: and be it enacted, that it shall be lawful for the company to raise the 200,000*l.* by creating new additional shares at 30*l.* per share, or at such other rate or value as the company, or a general meeting, shall think proper to declare. And this shall be deemed a public act.

N. B. The immense sum of 614,100*l.* raised to complete only one canal, proves the inexhaustible resources and riches of the country, as well as the wonderful spirit of individuals to apply so large a portion of their property in speculations in trade, but the utility of which is demonstrated by the effect. The clauses to secure private property, and those usual in navigation acts are well timed and particularly well adapted.

**SALISBURY TO SOUTHAMPTON AND NORTHAM CANAL,  
TO ALTER AND AMEND. 1800.**

The preamble states, that an act passed 35 Geo. III. whereby certain persons therein named and their successors were incorporated by the name and style of the Company of Proprietors for making and maintaining a Navigable Canal from the town of South-

ampton to the city of New Sarum, in the county of Wilts, with a collateral branch to Northam within the liberties of the town of Southampton, and they were authorised to raise among themselves the sum of 56,000*l*. And the company have proceeded in the execution of that act, and have laid out the whole of the line of the said canal and collateral branch, and have cut a considerable part thereof, and have expended the said sum of 56,000*l*. without being able to complete the said canal, and have endeavoured to procure the further sum of 15,000*l*. (part of the additional sum of 30,000*l*. authorised to be raised by that act) by additional shares as therein directed, but without effect; and it would tend to a more speedy and effectual completion of the said canal, if the said company were empowered to raise the whole of the said sum of 30,000*l*. and also an additional sum of money by mortgage of the tolls, rates, and duties of the said canal, and it is therefore requisite the said recited act should be amended and altered: therefore be it enacted, that the said company of proprietors may raise 40,000*l*. (above the former 56,000*l*.) or any part thereof, as the company may think proper, at legal interest, on the credit of the canal and collateral branch; and that no second sum of money shall be drawn out of the treasurer's hands until it shall be made appear by clear and proper vouchers, at a meeting of the committee, that the former sum drawn for has been properly and faithfully expended. And this shall be taken and deemed a public act.

N. B. This as well as the former short amended act proves a great deal may be said to the purpose in a little compass, and be as efficient as a long detail,



and it is to be hoped the assistance given by this act will enable the company to complete that most useful navigation and the collateral branch.

**HORNCASTLE CANAL, TO AMEND. 1800.**

The preamble states, that an act passed 32 Geo. III. whereby certain persons therein named were incorporated by the name of the company of Proprietors of the Horncastle navigation, in the county of Lincoln, and were authorised to deepen, widen, and enlarge the said canal from the junction thereof with the river Witham to the town of Tattersal, to extend the same into the river Bain, to make the river Bain and several streams communicating therewith, near or in the town of Horncastle, navigable into the town of Horncastle; and for that purpose to raise among themselves the sum of 15,000*l.* and in case that sum was insufficient, they were to raise among themselves or by mortgage 10,000*l.* more and whereas great progress has been made in the work, and they have raised and expended not only to the amount of the 15,000*l.* but have also borrowed great part of the further sum of 10,000*l.* and have incurred some debts, and are greatly in arrear to the several subscribers for interest on their several subscriptions, and without being enabled to raise a larger sum of money they will be unable to complete the works of the said undertaking, and to discharge their debts: Therefore be it enacted, that the said company be hereby authorised to raise, as soon as the passing of this act, the further sum of 20,000*l.* either by themselves or the admission of new subscribers, or by mortgage, or annuities, or on bonds; and to pay the interest of which and the other advances, additional tonnage, rates, and duties

are hereby authorised to be taken, as by the act is therein expressed. And this shall be taken and deemed a public act.

N. B. The clauses to secure private property are few but expressive, and the usual navigation act clauses are couched in as concise a manner as possible; and by the goods mentioned passing on the canal, and the new tonnage arising therefrom, it should appear, when complete, to be of the utmost utility.

KENNET AND AVON CANAL, TO AMEND. 1801.

The preamble states, that an act passed 34 Geo. III. whereby certain persons and their successors were incorporated by the name of the Company of Proprietors of the Kennet and Avon Canal Navigation, were authorised to make, complete, and maintain the said navigation in manner thereby directed, and to raise among themselves 420,000*l.* to complete the same, in 3,500 shares, and no person was to hold less than half a share, nor more than 50 shares, and if the said sum should be found insufficient, the company was empowered to raise the further sum of 150,000*l.* more, either by themselves or admission of new subscribers, or by mortgage or annuity; the shares to be deemed personal estate. And whereas by another act passed in 36 Geo. III. to vary and alter the line of the canal, authorised to be made by an act passed in the 34th Geo. III. for making a navigable canal from the river Kennet at or near the town of Newbury, in Berkshire, to the river Avon, at or near the city of Bath, and also certain navigable cuts, as are therein described; the said company were empowered to vary the line of the canal: and whereas by an act 38 Geo. III. the company were authorised

to vary the line of the canal, and the said recited acts were amended, and the said company have proceeded in making and completing certain parts of the said canal, and calls to the amount of 120*l.* shares, and 60*l.* a half share, being the due proportion of the sum of 420,000*l.* in respect to the 3500 shares have been made, and a number of shares and half shares have been declared by the committee to be forfeited, and have been merged, and the money due thereon has been called for by the committee upon the proprietors of the remaining shares and half shares in the said undertaking, amounting to 17*l.* 4*s.* 7½*d.* on each share, and 8*l.* 12*s.* 3¼*d.* on each half share, and there is yet a further sum wanting, and necessary, more than the said company have been able to raise or can borrow by virtue of the said acts to complete the said canal and works, and the said proprietors are desirous of being relieved from contributing any further sums in respect of any other of the said shares and half shares which may hereafter be merged, and that an adequate sum may be raised to complete the said canal by voluntary subscriptions for new shares in the said undertaking in manner hereafter mentioned; and the said recited acts are in other respects defective, and the powers and provisions thereof require to be altered and amended: therefore be it enacted, that for carrying into execution the purposes of the said recited act, and this act, it shall be lawful for the said company of proprietors to raise the farther sum of 240,000*l.* by creating 4000 new shares, and that 3000 of the said new shares may be taken by such of the present proprietors of shares and half shares in the said undertaking as have subscribed to the same

at 60*l.* a share, and to be divisible into half shares, and the remaining 1000 new shares may be disposed of by the committee by public auctions, at the Exchange Coffee-house in Bristol, or Garraway's Coffee-house in London, or some other suitable place as the committee may think proper, and not less than 20 nor more than 50 shares to be sold in one day's sale, all which shares and half shares shall be deemed personal estate, and be transmissible as such, and all the provisions of the former acts extended to such new shares, and not more than 5*l.* a share, nor more than 2*l.* 10*s.* a half share shall be called for at any one time, nor above 15*l.* per share and 7*l.* 10*s.* per half share be called for in the whole in any one year, and that no call shall be made until at least 3000 shares are subscribed for; and no proprietor shall have more than 50 shares, and may vote for every share not exceeding 30 either by person or proxy; and if the 4000 shares should not be disposed of to raise the 240,000*l.* it may be raised by mortgage, promissory notes, or annuities. And it is farther enacted, that no interest shall be payable for the money so to be called on for the new shares and half shares of this undertaking until the canal and said works shall be completed and finished. The rates, tolls, and duties which shall be received by the company, after paying of such rents and other payments as are charged thereon, shall be applied to the completing and finishing the said canal. And this shall be taken and deemed a public act.

N. B. This act is rather prolix, and complicated with other navigations, so that it is dubious giving an opinion on the whole. The clauses seem to be

guarded to secure private property, and the usual navigation clauses are proper and sufficient.

GRAND SURRY CANAL. 1801.

The preamble states, that an act passed in 41st of Geo. III. that certain persons and their successors shall be one body politic and corporate by the name and style of the Company of Proprietors of the Grand Surry Canal Navigation, empowered to make the said canal, branches, and collateral cuts therein authorised to be made, and the said company are empowered to raise among themselves or otherwise 60,000*l.* to be divided into shares of 100*l.* each, to have votes personally or by proxy as usual, and the shares to be personal estate; and if not raised among themselves it may be raised by bond or mortgage, which mortgage may be transferred in the usual way.

The company are hereby authorised to make and maintain a canal navigable for boats, barges, and other vessels out of the river Thames, at or near Wilkinson's gun wharf in the parish of St. Mary, Rotherhithe, in the county of Surry, to a place called Woodpecker's Lane in the parish of St. Nicholas, Deptford, in Kent, and from thence to near or through the several parishes, townships, hamlets, and places of St. Giles, Camberwell, Walworth, St. Mary, Lambeth, Kennington Common, Stockwell, Clapham, Balham, Streatham, Upper Tooting, Lower Tooting, to the town of Mitcham, in the county of Surry; and also to make and maintain divers collateral cuts and branches navigable for boats, barges, and other vessels from and through the following places, that is to say, from the said canal near to his Majesty's

victualling office, in Kent, and from Woodpecker's Lane to Butt Lane, in Deptford, and to Peckham, and from thence to Horsemonger Lane in the parish of St. Mary, Newington, in Surry, and from Kennington Common in the said county to enter and communicate with the river Thames at or near Cumberland Gardens, at Vauxhall in the parish of St. Mary, Lambeth, in the county of Surry aforesaid, and to supply the said canal and branches, and collateral cuts whilst making, and at all times for ever after the same shall be made, with water from the said river Thames, and from all rivers, brooks, springs, streams, rivulets, and water courses which shall be found in digging the said canal, excepting within 2000 yards of the river Wandle or any other stream running into the same. And the said company may make rail-ways or navigable cuts, with towing-paths to the same, from any part of the said canal to any place within 1500 yards thereof, having the land owners' consent and paying for the ground, so that such cut shall not be within 2000 yards of the said river Wandle, and no water to be taken out of the aforesaid river Wandle for the use of the canal or cut under any pretence whatever.

And it is further enacted, that where the said canal shall cross and pass over the river Wandle the company shall erect, and for ever maintain, a good and sufficient aqueduct or aqueducts, the height of which during the whole breadth and length thereof across the said river shall be at least 15 feet, measuring from the surface of the water of the river Wandle at mark-stake high to the surface of the water in the said canal. And further, that where the said canal shall cross and pass over a certain intended

rail-way to be established from Wandsworth to Croyden and Carshalton, in the county of Surry, under the authority of a bill now pending in parliament, if the same shall be carried into a law, the said company shall, at their own expense, erect, and for ever maintain, a good and sufficient aqueduct, which shall in no case occupy in depth more than four feet from the surface of the water in the said canal, (on the same level on which it crosses the river Wandle) to the underside of the said aqueduct, so that loaded carriages may pass under the same without obstruction; and that the span of the arch or opening of the aqueduct shall be full 16 feet wide.

And the said company may make rollers, inclined planes, rail-ways, waggon-ways, cranes, fire or steam engines, or other works, cuts, or branches to the said canal, as they shall think proper; and the breadth of the canal, or the branch or cut, with the towing-paths, ditches, drains, and fences, shall not exceed 33 yards, except in such places where any docks, basins, reservoirs, or pens of water, shall be made, or where it shall be judged proper for boats, or other vessels to turn, lie, or pass each other, or where engines, warehouses, cranes, or weighing-beams may be erected, or wharfs for the reception of coals, timber, goods, wares, or merchandise, or where the canal branches, collateral cut or cuts, shall be raised, or cut above five feet deeper than the present surface of land.

And the said company may, and are authorised to make a collateral cut from the said canal near to the town of Deptford, in Kent, into Greenland Dock, in the county of Surry, which said dock, in consideration of certain sums of money, annual pay-

ments, or otherwise, as shall be agreed on between the proprietors of the said dock and the canal company, shall be free and open for the company's boats, barges, or other vessels, as they may direct to make use of, lay in, load, or unload, pass through, into, or out of the said canal, and to be under all such rules, regulations, and bye laws as the canal, branches, collateral cuts, and other works are subject to; and a plan, with a book of reference, of the line of the canal, branches, and collateral cuts, are deposited with the clerks of the peace for Kent and Surry, and with the clerk of the company, which shall not be deviated from without the consent of the land-owners, in writing; and every boat, barge, or other vessel passing in or out of any lock immediately communicating with the Thames, shall pay for the same as one mile of regulated tonnage, and which in no case shall be less than five tons; or for passing any inclined plane, the same as a lock: the articles liable to pay tonnage are every thing that it is possible to think of or enumerate, and from 2*d.* to 6*d.* per ton per mile.

And the company shall pay to the Lord Mayor and Commonalty, and Citizens of the city of London, the sum of 2*l.* 2*s.* as a fine or acknowledgment for the liberty of opening or enlarging communications between the said canal and the river Thames, at or near Wilkinson's gun wharf, and at or near Vauxhall, as aforesaid; and shall also pay to the Lord Mayor, Commonalty, and Citizens of London, their successors, collectors, or assigns for ever, an annual rent or sum of 60*l.* to be paid half-yearly, at Lady-day and Michaelmas; and the width



of the lock entering the Thames, at Wilkinson's gun wharf, and also at Vauxhall, shall not exceed 32 feet. And this shall be taken and deemed a public act.

N. B. This is a very long act, containing 91 clauses, many of which are for securing private property, and the other as usual in all canal navigation acts, with others for securing the rights and privileges of the citizens of London.

#### RIVER HULL TO LEVEN BRIDGE CANAL. 1801.

The preamble states, that the making and maintaining a navigable canal from the river Hull, in the East Riding of the county of York, to Leven Bridge, near the town of Leven, would not only open a communication for the more commodious conveyance of goods, wares, and merchandise, between the said town of Leven and the port of Kingston-upon-Hull, but would also tend to the improvement of the agriculture of the country, by rendering the carriage of lime and manure more easy and convenient, and would in other respects be of public utility. And whereas Charlotte Bethell, of Rise, in the county of York, widow, is seised or possessed of the lands and grounds through which the said canal is to pass, and is willing and desirous to make and complete such canal, and whereas part of the said lands and grounds are copyhold, and held of the manor of Leven, of which manor the said Charlotte Bethell is the lady; and in order for facilitating this intended navigation, she hath purchased the copyhold interest in such part of such lands and grounds, and the same (consisting of about 10 acres) have been surrendered

to the use of her and her heirs, whereby the copyhold interest therein has been extinguished; and she the said Charlotte Bethell is willing to be at the expense of making and completing such navigable canal; but inasmuch as such cannot be done without the authority of parliament, be it therefore enacted, that from and after the passing of this act, the said Charlotte Bethell shall and may, and she and her tenants are hereby empowered to make and complete a navigable canal for boats, barges, and other vessels from and out of the river Hull, in the parish of Leven, near the boundary between Eske and Leven Cans, to Leven bridge, in the same Riding, and to supply the said canal with water from the river Hull, and all such brooks, springs, &c. as shall be found in digging or making the said canal; and also such and so many soughs, tunnels, feeders, aqueducts, and channels, for supplying the said canal with water, as the said Charlotte Bethell, or the persons authorised, shall deem proper; and may make, build, and erect upon the said canal, or upon the lands adjoining or near the same, bridges, piers, arches, tunnels, aqueducts, sluices, flood-gates, weirs, pens for water, water stanks, dams, wharfs, quays, toll-houses, warehouses, houses, landing-places, weighing-beams, cranes, fire-engines, or other machines, dry docks, and other works, ways, roads, and conveniencies, as and where the said Charlotte Bethell, or persons so authorised as aforesaid, shall think proper and convenient for the said navigation.

And the lands or grounds taken for the use of the said canal, and for the towing-paths, ditches, drains, and fences, shall not exceed 46 yards in breadth, except where basins, docks, or pens of water shall be

made, or where the said canal shall be cut above nine feet deeper than the present surface of land, nor in any place above 52 yards broad; and a map describing the line of the canal, and a book of reference, are deposited with the clerk of the peace for the East Riding, which shall not be deviated from, without the consent of the owners and occupiers of lands, and shall not be subject to the controul of the commissioners of sewers; and the said canal shall be made by the direction, and pursuant to the determination of William Jessop, of Newark-upon-Trent, engineer, and James Creassy, of Buxwood Coppice, in Sussex, engineer; and in case either of the above-named engineers should die, or decline to act, or if the two engineers should differ in opinion, all the powers and authorities shall be transferred and vested in John Rennie, of Stamford-Street, in the county of Surry, engineer, and if he should die or decline to act, then unto such engineer as the two engineers shall appoint in writing; and the lord or lady of the said manor, for the time being, shall have the whole exclusive right of fishery of the said canal. And this shall be deemed a public act.

#### WILTS AND BERKS CANAL. 1801.

The preamble states, that an act passed 35 Geo. III. whereby certain persons, and their successors therein described, were united into a company for making and completing a canal and cuts, by the name and style of The Company of Proprietors of the Wilts and Berks Canal Navigation, and were authorised to raise among themselves 111,900*l.* for making, carrying on, and completing the said canal, and other works and conveniencies thereto belonging.

to be divided into shares of 100 £. each; and if that sum should be found insufficient, the said company may raise further sums of money, so as the whole sum shall not exceed 150,000 £. any part of the last mentioned sum may be raised by mortgage, notes, bonds, or annuities. And whereas only 74,100 £. part of the 111,900 £. was originally subscribed, and only the sum of 61,512 £. Or. 10s. has yet been actually paid, and the treasurer to the said company has advanced to them the sum of 2,796 £. 15s. 7d. for which the company have engaged to pay him interest, and that all the money that has been raised has been expended in the prosecution of the works, and in carrying into effect the purposes of the said recited act, and have also incurred sundry debts in forwarding the said undertaking, and have completed a great part thereof, but it is found that much more expense has been and will be incurred in completing the said undertaking than it was originally estimated at, and more money than the company have been able to raise will be required to discharge the said debts, and finish and complete the canal, cuts, and other works by the said act authorised to be done; and the powers and provisions in the said act have been found defective, and it is requisite that they should be altered and extended: Therefore be it enacted, that the said company be hereby authorised to raise the sum of 200,000 £. or so much thereof as shall be necessary for the completing the said canal navigation and works, over and above the said sum of 111,900 £. in the said recited act mentioned, (although the last mentioned sum, by reason of the whole not being subscribed for, and the

arrears of calls or subscriptions, and interest due on sums advanced, hath not been wholly raised) and that the money to be raised by virtue of this act shall be applied in paying the debts owing by the said company, including the said sum of 3,796*l.* 15*s.* 7*d.* advanced to them as aforesaid, and for which they have engaged to pay interest, and such further debts as they shall contract in completing the said canal, cuts, and other works, and the money may be procured by creating new shares, or on mortgage or promissory notes, payable in 10 years, with 5*l.* per cent. or made stock of in the canal; the voting by new admission shares to be as in the other recited act as to original shares, and to be deemed personal estate. And this shall be taken and deemed a public act.

N. B. Here are a vast many clauses (50 in all) most of which are what are termed canal navigation clauses, to secure and explain where one canal is liable to trench on another, and therefore many explanations, describing the termination of the canal, branches, and cuts, at Chippenham, Calne, Trowbridge, &c. The junction with the Kennet and Avon and Abingdon are carefully explained in the act, too long and useless to insert here. One thing more ought to be noticed, to shew how exact the estimate is made for completing the whole of the works, 111,900*l.*—and can have the assurance to petition parliament for a new act to raise 200,000*l.* to finish!

ELLESMERE CANAL, TO ALTER, EXTEND, AND  
AMEND. 1801.

The preamble states, that an act passed in 33 Geo. III. for making and maintaining a navigable canal from the river Severn, at Shrewsbury, to the river Mersey, at or near Netherpool, in Cheshire, and also for making certain collateral cuts from the said canal; and certain persons therein named, who should be nominated and appointed in manner therein mentioned, were united into one body corporate, by the name and style of The Company of Proprietors of the Ellesmere Canal, and were authorised to make and complete a canal, navigable for boats, barges, and other vessels, from and out of the river Severn, in the liberties of the town of Shrewsbury, in the county of Salop, to unite with the river Mersey, at Netherpool, in the county of Chester, and also to make several collateral cuts to branch out of the said canal, as in the said act mentioned.

And whereas by another act of 36 Geo. III. to explain and amend that passed in the 33 Geo. III. for making a navigable canal from the river Severn, at Shrewsbury, to the river Mersey, at Netherpool, and making certain collateral cuts from the canal, and varying and altering the parts of the Whitchurch line of the said canal, and for extending the same from Franckton common to Sherryman's bridge, in the said parish of Whitchurch, in the county of Salop, and for making several other branches and collateral cuts to communicate therewith; the said company were authorised to vary and alter the line of the said canal and cuts between Franckton common and Whitchurch, in the same act mentioned; and to

make, extend, and maintain several new branches to communicate therewith. And by another act of 36 Geo. III. to explain and amend that of 33 Geo. III. the company of the said Ellesmere canal were authorised to vary the line of the said canal and cuts between Ruabon and the city of Chester, and to make several new branches to communicate therewith; and it is requisite that some of the powers of the said recited acts should be altered, Therefore be it enacted, that the said company of the Ellesmere canal shall be and are authorised, immediately after passing this act, to make and extend a new branch from the said Whitchurch branch of the said Ellesmere canal, at a place called the New Mills, in the parish of Whitchurch, to communicate with the said Chester canal, in the township of Stoke, and parish of Acton, in Cheshire, with such trenches, feeders, and other works and conveniencies as may be necessary for such new branch of the canal, which said branch or extension of the said Ellesmere canal is intended to be made through the several parishes of Whitchurch, Doddington, Whitchurch, and Hinton, in Shropshire, Malpas, Wrenbury, Baddily, and Acton, in Cheshire, Tushingham-cum-Grindley, Bickley, Wirswall, Marbury-cum-Quoisley, Marbury, Norbury, Wrenbury-cum-Frith, Baddily, Burland, Hurleston, and Stoke, all in the county of Chester. And the said company of the Ellesmere canal are authorised to erect and execute all such works as shall be requisite for making and completing the said branch and extension of the Ellesmere canal.

And a survey has been made to ascertain the certainty of making the said branch and extension of the Ellesmere canal, and three plans and

books of reference are left with the clerks of the peace for the counties of Salop and Chester, and with the clerk of the Company, in order to shew the line or course of such branch and extension, which is not to be deviated from without the consent of the owners or occupiers of the lands and grounds through which it may be wanted to pass ; and if there are any errors in describing the line, it is not to prevent the making the canal. And this is deemed and taken as a public act.

N. B. There is in this act a vast number of clauses to secure private property, in case any deviation should be made from the line laid down in the plans. This is the fourth act passed for the Ellesmere canal, and although every act made was not to be deviated from, yet each of them has been violated ; the other clauses are as usual in all canal navigation acts.

**GRAND JUNCTION CANAL, FOR ALTERING. 1801.**

The preamble states, that by an act passed in the 33 Geo. III. for making a navigable canal from the Oxford canal, at Braunston, in Northamptonshire, to join the river Thames, at or near Brentford, in Middlesex, and also certain collateral cuts from the said canal, certain persons in the said act named were incorporated by the name and style of The Company of Proprietors of the Grand Junction Canal, for making the said canal and collateral cuts, and several other works necessary for carrying the said act into execution, and were authorised to raise 600,000 *l.* And by another act of the 34 Geo. III. the company were authorised to make navigable cuts from the towns of Buckingham and Aylesbury, in Bucking-



hamshire, to communicate with the said canal, and a cut or feeder from the town of Wendover, in the said county, to the summit of the canal at Tring, in Hertfordshire, for the purpose of supplying the said canal with water. And another act was obtained in the 35 Geo. III. to authorise the said company to vary the course of a part of the canal in Hertfordshire, and for amending and altering the first recited act. And two other acts were made in the 33 Geo. III. one for making a navigable cut from the said canal at Norwood, in Middlesex, to Paddington; and the other to make a navigable cut from the town of Watford to the town of St. Albans, in Hertfordshire. And another act was passed in the 36 Geo. III. for enabling the company to finish and complete the same, and the several cuts and other works authorised to be made and done; they were also empowered to raise 225,000 *l.* for carrying on and completing the said canal and works. And another act was passed in the 38 Geo. III. for confirming and carrying into execution certain articles of agreement with eight land-owners, as is more particularly therein mentioned.

And the said company are empowered to make, build, and erect wharfs, quays, market-houses, warehouses, weighing-beams, cranes, engines, machines, and other works, ways, roads, and conveniencies, at Paddington aforesaid, at or near the termination of the said navigable cut, from the said Grand Junction canal to that place, and to provide and supply the inhabitants of any buildings in the parish of Paddington, and the parishes and streets adjacent, with good and wholesome water, who might be desirous of contracting with the company for the same; and to

enable the said company to carry on and complete the said navigable cut from the Grand Junction canal at Norwood to Paddington, they were authorised to raise 150,000 *l.* more ; and whereas the said company are proceeding in their several works, and have completed the collateral cut or feeder from Wendover to Tring, and have **nearly completed** the main line of the said canal, and the collateral cut therefrom to Paddington, and have also made great progress, and completed a considerable part of the collateral cut from the town of Buckingham to Old Stratford, in the county of Northampton, in which works they have expended very large sums of money ; and whereas, from the great advance in the price of labour and all sorts of materials, the expenses of the said company have been increased very considerably beyond the original estimates, whereby they have contracted debts to a great amount, and they find that the several sums of money already authorised to be raised by them will not discharge the same ; and it is expedient that the company should be authorised to provide for the discharge of their debts, and to be enabled to finish and complete the whole of the said works, and that the powers and provisions of the said seven acts should be altered and enlarged, Therefore be it enacted, that the company of proprietors of the Grand Junction canal be hereby authorised to raise 150,000 *l.* (although the whole sum of 975,000 *l.* allowed to be raised by virtue of the before recited acts, may not have been raised) and the said sum of 150,000 *l.* or such part thereof as the said company or their committee shall think proper, together with such part or parts of the said

sum of 975,000 *l.* as aforesaid, shall or may be raised by any of the ways and means that the said company are authorised to raise money by the said recited acts, either by mortgage or annuities, or promissory notes, or by creating new shares, or in any way and manner they may think proper.

And, by the first recited act, the company, in making the said canal and collateral cuts, were not to deviate more than 100 yards from the lines described on certain plans and books of reference, deposited in the office of the clerks of the peace for the counties of Northampton, Buckingham, Bedford, Hertford, and Middlesex, without the consent, in writing, of the person or persons through whose lands or grounds such deviation should be made.

And the company agrees with the Lord Mayor, Commonalty, and Citizens of London, in lieu of the old usual duty of one halfpenny per ton on all goods, &c. passing west of London bridge, to Strand on the Green, or Brentford, to pay 600 *l.* a year for ever, free and clear of all deductions whatever, of lawful money of the united kingdom of Great Britain and Ireland, and by quarterly payments; and if not paid, they have leave, liberty, and power to seize all boats, barges, and merchandise, on any part of the canal. And this is deemed a public act.

N. B. This is the eighth act which has passed for the Grand Junction canal, each of them providing against the prescribed line being deviated from, yet each succeeding one enacting a line of deviation from the former; but these changes do not even terminate with this act, for in 1803, the Grand Junction company were again compelled to apply

to parliament for alterations and amendments, after expending the immense sum of 1,125,000*l.* It is painful to notice, and I should wish for the future to avoid mentioning where lines are so ill chosen, and the expense so shamefully miscalculated.

RIVER FOSS CANAL, TO AMEND. 1801.

The preamble states, that an act passed 33 Geo. III. whereby certain persons and their successors should be one body corporate and politic by the name of the Foss Navigation Company, and were authorised to make and complete a canal navigable for boats, barges, and other vessels, from the junction of the river Foss with the river Ouse, at or near the city of York, to Stillington mill near the turnpike road leading from York to Helmsley Blackmoor, in the course and direction described in plans and a book of reference of the intended canal, which are deposited with the clerk of the peace for the North Riding of Yorkshire and the city of York. And the said company were empowered to raise among themselves the sum of 25,400*l.* and if that sum was found insufficient they might raise 10,000*l.* more, to be divided into shares of 100*l.* each, and no proprietor should have less than one share, nor more than 20 shares; and if the said company did not raise the last sum of 10,000*l.* among themselves by subscription, they were empowered to borrow it on mortgage; and the company have proceeded in making and completing certain parts of the said navigation and drainage, and other works authorised by the said act, and have expended the whole of the 25,400*l.* and a further sum which they have been enabled to borrow as part of the 10,000*l.* and have also incurred sundry debts,

as well for lands as for materials, utensils, and implements used in the prosecution of the said undertaking, and are now greatly in arrears to mortgagees for interest, and have attempted and endeavoured to borrow the residue of the 10,000*l.* but have not been able to procure it ; and the creditors are very pressing for principal and interest, and several of them have given notice of enforcing payment of their demands by law ; and the said company, unless they are among themselves enabled to raise, and to enforce the payment of a larger sum of money than they are at present empowered to do, will be incapable of discharging the said debts, or complete the undertaking, and uphold so much thereof as is finished, and the said recited act is in many places defective, and it is requisite that the same should be altered and amended : therefore be it enacted, that the said company be empowered to raise 10,000*l.* (over and above the 25,400*l.* which has been raised and expended) by a new subscription, or by admission of new subscribers, which shall be immediately applied to the payment of the several debts and mortgage, and then for the finishing and completing the said navigation and drainage, and the reservoirs, feeders, wharfs, quays, ways, and other necessary works and conveniences of the said undertaking ; and the said company are authorised, that after the navigation is completed to Sheriff-Hutton bridge, and shall be of opinion that the money remaining in hand out of the said 10,000*l.* is insufficient to perfect the canal to Stillington mill, they may be at their own option to proceed farther in the works, until they have raised more money to perfect the same to Stillington mill ; and if any money remains in hand unappropriated

of the 10,000*l.* they may plate it out at interest or otherwise dispose of it; but if it should be found insufficient to pay all debts, mortgages, and interest for which the last sum of 10,000*l.* was intended, independent of completing the said canal, drainage, and other works, to effectuate which, and to enable them to complete the whole of the navigation to Stillington mill, the said company are hereby authorised and empowered to raise 10,000*l.* more on mortgage, on the credit of the said navigation and undertaking; and the money so borrowed, after paying all debts, to be employed in completing the said navigation and drainage, and to no other use or purpose whatever.

And whereas by the recited act, the company were not to deviate more than 100 yards from the line laid down in the plans and book of reference, and it now appears that the restriction of 100 yards will be a matter of great inconvenience to the said Foss canal company, and in order to obviate all doubts, be it enacted, that immediately after the passing of this act the company may deviate from the line or course as described in such plans to any distance, consent having previously been obtained in writing from the owners through whose lands it shall pass, and paying for the same as the act directs, and the proprietors are allowed to have 30 shares instead of 20 shares, as the former act limited, and may also retain any further number of shares as may come by will. And the said company have power to advance tonnage for all heavy articles, as is therein expressed, 1½*d.* per ton per mile. And this shall be deemed a public act.

N. B. There do not appear any private property clauses in this short act; but the usual navigation

clauses are multiplied, yet no more than necessary for explanation.'

CROYDON CANAL. 1801.

The preamble states, that the making of a navigable canal for the passage of boats, barges, and other vessels from or near the town of Croydon, Surry, into the grand Surry canal in the parish of Deptford, will open a communication for the cheap and easy conveyance of all kinds of commodities from the counties of Sussex, Surry, and Kent to the metropolis, and of coals, manure, and other articles from thence into the country, and will improve the lands and estates through and near which it will pass; and will be of public utility, and the supplying the towns of Croydon, Streatham, Dulwich, Norwood, and Sydenham with water from the said canal will be a great accommodation to those several towns. And whereas the several parties hereafter named are willing and desirous, at their own expense, to make and maintain such canal and other works requisite for the said purposes: be it enacted, that (here follow the names of subscribers) and other persons shall be one body politic and corporate by the name of the Company of Proprietors of the Croydon Canal, and they are authorised and empowered to make and complete, and keep navigable and passable for boats and other vessels, a canal from near the town of Croydon through the parishes of Croydon, Battersea, Camberwell, Deptford, and Rotherhithe, and of Beckenham and Lewisham, and the township of Sydenham, into the grand Surry canal in Deptford parish, and also to make and lay aqueducts, pipes, and other conveniences, above or

under ground, from the said canal to Croydon, Streatham, Dulwich, Sydenham, and Norwood, in the lines and directions expressed in the plan hereafter mentioned; and the said company are hereby fully empowered at all times, for ever after the canal shall be made, to supply it with water from the grand Surry canal, and to make feeders, tunnels, and shafts, as also stop-gates, weirs, engines, steam-engines and other machines for supplying the said canal and aqueducts, as the said company shall think proper.

And the said company are hereby allowed to make a deviation of the canal from the line in the plan near New Cross, as is therein particularly mentioned, and shall not on any pretence suffer water to be taken or diverted from the water-course which rises in the parish of Croydon, and joins the river Wandle near Merton mills, nor any water whatever from the said river Wandle; but both water-course and river, where the same shall or may be crossed by the canal or aqueducts, shall be well and effectually tunnelled and conducted under the said canal, aqueducts, or other works, so as the whole of the said water-course or stream may continue to flow into the river Wandle as usual.

And it is also enacted, that in making the said canal from at or near Croydon to Selhurst Wood, the same shall not be cut more than 3 feet below the mean level of the highest part of Croydon common on the line of the canal, and that the surface of the water in the said canal shall be for ever maintained to be two feet above the said mean level (making the entire depth 5 feet) subject to after regulations.



And it is further enacted, that a pipe of sufficient dimensions to be capable of conveying away from the canal into the river Wandle, half the quantity of water which the steam engine or any other machine may raise into the summit level, during the time the water therein shall be more than  $16\frac{1}{4}$  inches lower than the full height, shall be fixed at or near the bottom of the canal, so as to open for the lowering of the water, and to let out the water therefrom whenever its surface shall be more than  $16\frac{1}{4}$  inches below the high water mark, which is to be fixed and maintained at the height of 2 feet above the mean level of Croydon common, as before mentioned, and the company shall not bore lower than 3 feet deep on the highest part of Croydon common, in any part of the line of the canal, from its commencement at Croydon, for the length of 2,500 yards, so as to divert the springs that rise on the same, but whatever excavation may be wanted for the purpose of obtaining earth for embankment, the bottom of such excavation shall decline towards the river Wandle, and be made at least one foot deeper than the bottom of the said canal.

And be it further enacted, that nothing herein contained shall authorise or empower the company to take any water for the use of the said canal or other works hereby authorised to be made out of or from the river Ravensbourne, or any stream, water-course, or rivulet running into that river.

And whereas a survey has been made to ascertain the practicability of making the said canal and aqueducts, and a plan with a book of reference has been made in consequence thereof to shew the line of the canal, inclined planes, and aqueducts,

and they are made in three parts, which are deposited with the clerks of the peace for Surry and Kent, and another with the clerk of the company, that line is not to be deviated from without the consent of the land-owner or occupier, except between Selhurst Wood to the first inclined plane, as it may be found necessary to raise the level of the said canal there, for which reason it may be found necessary to deviate from the original line on the north side thereof, but not to exceed 200 yards. The lands to be taken and used for making the said canal, towing-paths, ditches, drains, and fences not to exceed 30 yards in breadth, except where docks, basins, or pens of water may be made, or where the said canal shall be raised higher or cut more than six feet below the present surface of the land, and except where boats, barges, and other vessels are to turn, lie, or pass each other, or where warehouses, cranes, or weigh beams may be erected, or where wharfs may be set out for receiving or delivery of goods, wares, and merchandise which shall be conveyed on the said navigation, and not above 100 yards in breadth at any place without consent of the owners. The present engineers to settle all differences that may occur, and fix the heights, levels, and water marks, are John Rennie and Ralph Dodd, and if they disagree or refuse to act, they are to chuse another or an umpire within three calender months after passing the act; and the basin, wharfs, warehouses, and other conveniences of the Croydon canal shall be made on the east side of the grand Surry canal, and on the south side of the basin intended to be made and already staked out for the grand Surry canal, and not within 100 yards of the said last mentioned basin ;

and such basin, wharfs, warehouses, and other conveniencies so to be erected by the said company of proprietors of the said Croydon canal, shall be used exclusively for the trade of the same.

And it is further enacted, that the said company may raise among themselves 50,000 *l.* towards making and maintaining the said canal, aqueducts, and other requisite works, and to be divided into shares of 100 *l.* each; and no proprietor to have less than one or more than five shares, unless they come by will or marriage, and to be personal estate; and every person to have a vote for every share, not exceeding five shares, either personally or by proxy; and if that sum should be found insufficient to complete the said canal and works, the company are empowered to raise the further sum of 30,000 *l.* by the old subscribers, or by creating new admission shares, or mortgage.

And it is further enacted, that the company shall pay to the Lord Mayor, Commonalty, and Citizens of London, their successors, collectors, or assigns for ever, an annual rent of 40 *l.* as a compensation for the diminution of tolls or duties, created and made payable by an act of the 17 Geo. III. to take tolls on the Thames westward of London bridge, within the liberties of the city of London, for the improvement of the river Thames, and to be paid half-yearly, at Lady-day and Michaelmas, yearly and every year for ever. And this to be taken and deemed a public act.

N. B. This is an exceeding long act, containing 127 clauses, many of which are to secure private property, and the usual clauses in all canal acts are multiplied exceedingly; a vast sum is allowed to be

raised to complete the navigation, but not having the advantage of any manufacturing towns, coal-mines, or any mines of minerals, or heavy articles to take to a market, I hope I shall be disappointed in my conjecture in fearing that it will never pay a proper interest for the money.

ELLESMERE CANAL, TO AMEND. 1802.

The preamble states, that an act passed in the 83 Geo. III. for making a navigable canal from the river Severn, at Shrewsbury, to the river Mersey, at Netherpool, in Cheshire, and making certain collateral cuts from the said canal, whereby certain persons therein named, together with other persons, were united into one body corporate, by the name of The Company of Proprietors of the Ellesmere Canal, and were authorised to make and complete a canal navigable for boats, barges, and other vessels from out of the river Severn, at Shrewsbury, to unite with the river Mersey, at Netherpool; and also to make and complete several collateral cuts to branch from and out of the said canal; and the said company were authorised to raise the sum of 400,000 *l.* and if that sum was insufficient, to raise 50,000 *l.* more; and in case the company should have occasion for any further sum, not exceeding 50,000 *l.* in addition to the said sums of 450,000 *l.* it may be raised by mortgage of the said undertaking. And by another act passed in the 36 Geo. III. to amend the last recited act, and also for making and maintaining certain cuts, and for varying and altering the Whitchurch line, and extending the same from Franckton common to Sherryman's bridge, and for making and maintaining several other branches and

collateral cuts to communicate therewith, the company were authorised to vary and alter the line of the said canal and cuts, between Franckton common and Whitchurch, as in the same act mentioned, and to make and extend several new branches to communicate therewith. And another act passed in the same year of 36 Geo. III. to amend and explain the last and former recited acts, and to make, vary, and alter certain parts of the course of the canal and cuts, between Ruabon and Chester, and for extending the same, and for making and completing several other branches and collateral cuts to communicate therewith. Another act was likewise obtained in the 41 Geo. III. to authorise the company of proprietors of the Ellesmere canal to extend the said canal from the Whitchurch branch thereof, at the New Mills, in the parish of Whitchurch, to communicate with the Chester canal, in the township of Stoke, in the parish of Acton, in Cheshire, and for altering and amending the several acts passed for making the said Ellesmere canal to communicate with the several branches before specified.

And whereas the making of that part of the said canal between Pont Cysyltee and the upper end of the said Cegedog Valley, will be attended with a very considerable expense, and it is reasonable that the said company should, if they make and maintain the same, be authorised to have, receive, and take the like rates of tonnage and wharfage on and upon the banks thereof, as they are by the acts of 33 Geo. III. to take and receive for coals, coak, culm, stone, lime, lime-stone, timber, and other goods and merchandise, matters and things, which shall be carried and conveyed upon any other part of the said canal

and cuts therein mentioned ; and whereas shares to a considerable amount of the sum of 400,000 £. which were intended to be originally subscribed by the said company among themselves for the purposes of the said undertaking, were reserved for the land-owners through whose lands the canal and cuts were authorised to pass, some of which land-owners have failed and declined to accept the shares so reserved for them as aforesaid, or to pay the calls or subscriptions thereon, by reason whereof, and the insolvency of some other of the original subscribers, the amount of the present stock of the said company is reduced to 333,000 £. the greatest part whereof hath been expended in the prosecution of the said undertaking ; and whereas the whole of the sum of 400,000 £. intended to have been originally raised among themselves, will be necessary for completing the said canal, branches, and cuts, and the several works by the said recited acts authorised to be made and executed, and it is absolutely necessary that the company be authorised to raise so much money as to make up the stock of 400,000 £. as first intended to have been contributed, or by mortgages, of two 50,000 £. and the company have completed a considerable part of the said canal and collateral cuts, but the powers in the said acts are found to be defective, and it is requisite the same should be altered and amended : Therefore be it enacted, that from and after the company have made and executed the last-mentioned part of the canal, between Pont Cysyltee, and the upper end of the Cegedog Valley, near Brumho, in the county of Denbigh, they shall be empowered to take the same rates of ton-

nage and wharfage upon the banks thereof, that they take on other parts of the canal and the collateral cuts therein mentioned.

And be it further enacted, that the said company are hereby empowered to raise £7,000 *l.* in addition to the 333,000 *l.* already raised, to make up the sum of 400,000 *l.* as originally intended to be raised, either on interest or by creating new or additional shares, and disposing of them at such price as they shall think proper; and which shares shall be entitled to the same powers, privileges, and advantages, and liable to the same restrictions, penalties, and forfeitures as the original shares first created. And this shall be taken and deemed a public act.

N. B. This being the fifth application to parliament from the proprietors of this canal, and the great caution taken to preserve its cuts and branches, prove its utility and value, not only to the company but to the nation in general.

TRENT AND MERSEY CANAL, TO ALTER AND  
AMEND. 1802.

The preamble states, that by an act passed in the 6 Geo. III. certain persons therein named were united into a body politic and corporate, by the name of The Company of Proprietors of the Navigation from the Trent to the Mersey, with power and authority, at their own costs and charges, to make and complete a navigable cut or canal passable for boats, barges, and other vessels, from the river Trent, below Wilden Ferry, in the county of Derby, to the river Mersey, near Runcorn Gap, and several commissioners were then appointed by the said act

for putting the several powers thereby vested in them into execution ; and whereas several additions, alterations, and amendments were made by the several acts of 10th, 15th, 16th, 23rd, & 37th Geo. III. all of which now require amendments and alterations: Therefore be it enacted, that from and after the passing of this act, the said company shall make and complete a rail-way from the canal at Stoke-upon-Trent, to Lane End ; and another rail-way from the said canal at Etruria, to Hanley ; and also another rail-way from the said canal at Dale Hall, to Burslem, in the county of Stafford, for the passage of waggons and carriages of different forms and constructions, and with burthens suitable to such rail-ways, to be approved of by the said company, and also to alter and vary the course of the rail-way from Froghall to Caldon, and a part of the said proposed canal from Froghall to Uttoxeter, near Alveton Mill, in the said county, and to do and perform all things necessary for making, perfecting, and completing these proposed rail-ways and other works ; and a plan of the line described for the rail-ways, and book of reference, are deposited with the clerk of the peace for the county of Stafford, which is not to be deviated from without the land-owners' consent in writing.

And whereas the said company, by an act of 6 Geo. III. were empowered to raise 130,000 *l.* to be divided into shares of 200 *l.* each ; and whereas it would be much more convenient to the company if the said 650 shares of 200 *l.* each, were divided into 1,300 shares of 100 *l.* each: Be it therefore enacted, that the said 650 shares of 200 *l.* each, shall be, and the same are hereby divided into 1,300 equal shares, or parts, and that no person, or body politic



or corporate, now or hereafter becoming a proprietor, shall have less than one or more than 50 shares, or vote personally or by proxy for more than 100 shares. And this shall be taken and deemed a public act.

N. B. It appears by this short act that after reciting the seven former acts, they had overlooked the particulars of the rail-ways, which wanted explanation; and their finishing the undertaking without soliciting more money, as also their dividing the 200 *l.* into 100 *l.* shares, is a proof of their acting wisely.

SOMERSETSHIRE COAL CANAL, TO VARY, ALTER,  
AND AMEND. 1802.

The preamble states, that by an act passed in the 34 Geo. III. certain persons and their successors therein named, were created a body politic and corporate, by the name of The Company of Proprietors of the Somersetshire Coal Canal Navigation, and were empowered to raise among themselves a sum of money for completing the said canal, not exceeding 80,000 *l.* and to be divided into 800 shares of 100 *l.* each, and no person as a proprietor to hold less than one or more than 40 shares in the undertaking; and if the said sum of 80,000 *l.* should be found insufficient, the company were authorised to raise 40,000 *l.* more, or to borrow and take up at interest the same, or any part thereof. And by an act passed in the 36 Geo. III. to vary and alter the line of the canal, authorised by the 34 Geo. III. entitled, An Act for making and maintaining a Navigable Canal, with certain Rail-ways and Stone Roads, from several Collieries in the County of Somerset, to communicate

with the intended Kennet and Avon Canal at Bradford, in Wiltshire, and to alter and amend the said Act; the said company were empowered to vary the said line of canal, and power was given to sink the shares of certain proprietors who had incurred forfeiture thereof into the rest of the shares of the said undertaking, and to expunge and strike out the names of the said proprietors, and the numbers of their shares.

And whereas the said company of proprietors have in the prosecution of the said works long since expended the said sum of 80,000 *l.* first authorised to be raised by the recited act, and did, by virtue of the power therein contained, agree to raise the further sum of 40,000 *l.* towards completing the said works, making together 120,000 *l.* for the whole of which, amounting to 150 *l.* per share, (except 3,768 *l.* 9s. 0d. in respect of the forfeited shares) the said company have made calls on the proprietors to the said undertaking; and whereas the sum of 104,136 *l.* only hath yet been paid by the said proprietors to the treasurers of the said undertaking; and the said treasurers are considerably in advance on account of the said company, and for which they have agreed to pay the said treasurers interest, and it would be much to the advantage of the company and the public, if they were empowered to alter the Dunkerton line, in the parishes of Coombhay and Southstoke, in the county of Somerset, and the Radstock line, in the parish of Wellow, and county aforesaid; and whereas the finishing the Radstock line of canal, and making such water communications, with the necessary works on both lines of the said canal, will be attended with a very considerable increased ex-

pense, of at least 37,000 *l.* and upwards, (exclusive of a very large annual expense in supplying the upper levels with water) and they have already expended considerably more than the original estimate in making and completing the canal and works; and whereas it is just and reasonable that, in the event of finishing the said Radstock line of canal, an extra tonnage, over and above the tonnage authorised to be raised by the first recited act, on all goods that shall pass from the upper to the lower, or from the lower to the upper levels, shall be levied to enable them to raise money to finish the said Radstock line of canal: Therefore be it enacted, that from and immediately after the passing of this act, the said company and their successors shall and are hereby authorised to vary and alter the said canal on the Dunkerton line thereof, from or near a bridge over the said canal, in the parish of Coombhay, in Somersetshire, called Black Furlong, and on the Radstock line of the said canal to the parish of Wellow, into the highway leading from Wellow to Twinnoe, in the county aforesaid; and to impose such additional tonnage as may be necessary. A plan and book of reference of all the intended cuts, lines, and variations, are deposited with the clerk of the peace for Somersetshire, and with the clerk of the company, and not to deviate from the line so laid down above 100 yards; and the powers of all former acts to be extended to this act.

And the said company are hereby authorised and empowered to raise a further sum of 20,000 *l.* over and above the 120,000 *l.* as expressed in the first recited act; and it is first to be applied in paying the debts owing by the company, and afterwards for finishing and completing the said canal navigation

and works, and in executing the several purposes of the said recited act, and this act; and the said sum of 20,000 *l.* may be raised on notes of 50 *l.* or 100 *l.* each, at six years, bearing lawful interest, or on mortgage or annuities.

And for the purpose of raising money to finish the Radstock line of canal, and to effect and maintain a water communication by means of locks or otherwise, between the upper and lower levels on both lines of the Somersetshire coal canal, and to erect steam-engines, and other necessary works, and also to purchase Dunkerton Mill: Be it further enacted, that over and above the said sum of 120,000 *l.* by the first recited act, and 20,000 *l.* by this act authorised to be raised as aforesaid, and although those sums may not have been wholly raised, the further sum of 45,000 *l.* may be raised under the authority of the same company for such last-mentioned purposes; and the Kennet and Avon canal company, and the Wilts and Berks canal company, are invited and required to subscribe one third each towards the sum of 45,000 *l.* as they will receive great benefits from this latter part of the Radstock navigation, and to receive all the benefits of original subscribers, by voting personally or by proxy, and equal shares of profits; and if those two companies agree to subscribe each their third, the Somersetshire coal company engage to subscribe the other third immediately; but should the Kennet and Avon, and Wilts and Berks canal companies refuse to subscribe their third each, then the Somersetshire canal company may raise it in what manner they think proper, and receive to their own benefit the advance on tonnage and lockage, as is hereby allowed to be taken on the

Radstock and Dunkerton lines of canal navigation. And this is to be taken and deemed a public act.

N. B. In this very long (75 clauses) complicated act, great care has been taken to secure private property, and also the property of other canals, whose trade and interest seem to clash with this; the immense sums subscribed and laid out prove it to be of vast importance, and there is an unusual number of navigation clauses, but which appear to be necessary for explanation.

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### WALES.

IMPROVEMENTS by internal navigation had been long neglected in this country, though as capable of them as England. Long had her mines of lead, copper, iron, coals, and many other minerals lain entirely neglected for want of that spirit of trade and encouragement necessary for exploring the contents of the bowels of her mountains; and although late, yet she at last sees the advantages of canals, some of which are cut into the very mountains which abound in every useful and necessary mineral; nor is the surface defective in the gifts of nature, for here is some of the finest ship building timber in the world, which, for ages in many places has been decaying for want of a proper conveyance to a market. The gentlemen of this country are at last awake to their true interest by observing the improvement of their neighbours on the opposite side of the Severn, and at last, by a most laudable spirit of enterprise in the land owners, will doubtless be

successful, and be a pattern for other parts of the country to improve on and follow.

#### CARDIFF TO MERTHYR TIDWELL CANAL.

In 1790 an act was obtained for cutting a canal from Cardiff to Merthyr Tidwell, a distance of 25 miles: it begins at Penmarth, just by Cardiff, and passes Llandaff and Pielly bridge to Merthyr Tidwell, and takes in those iron furnaces which have begun to work, and where, no doubt, from this easy conveyance, that new ones will be erected, as this easy and cheap carriage to a market for such heavy articles was all that was wanted. The lime-stone and coals which before were useless to the owner will now find, by this canal, a ready consumption and easy carriage; and it is to be hoped that this will be a prosperous and profitable undertaking, and induce them to extend this mode of conveyance into every part of the country. This canal is finished, and likely to be very productive, so as to exceed the company's most sanguine expectations.

#### NEATH TO FURNO VAUGHAN CANAL.

A canal from Neath to Furno Vaughan has long been in contemplation, and application was made to parliament in 1790, and it appearing to the honourable House of Commons that it would be of the greatest utility, an act was immediately granted for cutting a canal from Neath, in Glamorganshire, to Furno Vaughan in the same county, being mountains abounding in coals, lime-stone, iron ore, copper, lead, &c. This canal is about 12 miles long; the rises and falls I have not yet got at; but it will be of the greatest advantage to the country in gene-

ral, as well as to the land owners, where the rich undisturbed bowels of the country lay useless for want of such conveyance.

#### KIDWELLY CANAL.

This canal is the private property of a Mr. Keymer, who has cut this canal between three and four miles long in his own estate from the town of Kidwelly, in Carmarthenshire, to his coal mines and lime-stone works, at his own expence, which at the same time enriches the worthy and respectable land owner, and is of the greatest service and utility to the neighbourhood for miles around him.

#### ABERDARE CANAL.

The act for cutting this canal from the village of Aberdare, in the county of Glamorgan, was obtained 33 Geo. III. and joins the Glamorgan canal at the fork made by the junction of the little river Cynon with the river Taff, and goes through a beautiful country parallel with the river Cynon to Aberdare, being in length  $7\frac{1}{4}$  miles; the first part is level, but the three miles next to Aberdare rise 40 feet. There is a rail-way from Aberdare, which crosses the Cynon at Aberdare, and joins the Neath canal at Abertnant, being in length 8 miles and a half. The company have the usual powers, and 26 yards is allowed for the width of the canal, towing-path, &c. and they are obliged to make a lock to prevent any floods from this canal to injure the Glamorgan canal; and they are empowered to raise 22,500*l.* in shares of 100*l.* each, as usual, and may raise 11,000*l.* more if wanted. Owners and occupiers of adjoining lands may navigate boats 12 feet long and 5 feet wide for husban-

dry use only, but not to pass any lock free of all rates.

As it was expected and foretold that unusual advantages might be expected from canals in this country ; no sooner did such speculations begin, than the emulation of the neighbouring gentlemen and land owners was roused to a proper sense of the treasures hid in the bowels of the mountains, and who are now increasing the useful method of canal navigation to bring those valuable minerals into use, not only to their own profit and advantage, but to the benefit of the whole country.

#### BRECKNOCK CANAL.

The act for this canal was obtained 33 Geo. III. and unites with the Monmouth Canal,  $8\frac{1}{4}$  miles from Newport, and one mile from Pontypool. It crosses the river Avon, where by a tunnel it goes through the highlands there, about 220 yards in length, and passes the town of Abergavenny, towards the river Usk, and proceeds parallel with that river to Brecknock, and is 33 miles in length, with 68 feet rise to Brecknock. From where it joins the Monmouth canal it is 11 miles to Abergavenny, and also for 3 miles farther it is level ; from thence to Brecknock is  $18\frac{1}{4}$  miles, with 68 feet rise ; from Abergavenny to the canal is one mile, and has a rail-way ; also from the canal at Cwm-Clydack to the Wain-Dew coal and iron-works there is a rail-way  $4\frac{3}{4}$  miles in length, and also another rail-road  $1\frac{1}{4}$  mile from the canal to Llangroiney, which crosses the river Usk.

The company have the usual powers, and are permitted 26 yards wide for canal, towing-paths, &c. and not to deviate above 200 yards from the line laid down. They are also allowed to raise 100,000*l*.



divided into shares of 100*l.* each, and no person to hold above 50 shares, unless willed by deaths, and they may raise 50,000*l.* more if wanted.

The greatest advantage will arise to the Monmouth canal company by means of this canal, therefore they have agreed to pay to this canal company 3000*l.* in March 1794; they also agree not to take for any goods, &c. navigated on this canal, a greater tonnage than that company takes, and never to take above the rates allowed the Monmouth canal company, which were before mentioned when treating of that canal; and as this canal goes also through a rich country in veins and mines of the most useful minerals, the hidden produce as well as the surface will find a ready way to a market, to the emolument of all concerned, even to the labourer who works in the mines.

#### SWANSEA CANAL.

The act for this canal was obtained 34 Geo. III. and goes from the town of Swansea in Glamorgan-shire, by Llandoor, being the copper works of Mr. Morris, of Morris Town, and thence runs parallel with the river Tawe, crosses the little river Twrch, and ends at Hen-noyadd. It is 17 miles long, and has 373 feet rise, that is to say, from Swansea to opposite Pont-ar-Taw, which is  $8\frac{1}{4}$  miles, it has 105 feet rise; thence to Pont Gwaynclawdd is 8 miles, and has 230 feet rise; the other three-quarters of a mile rises 31 feet.

The company have the usual powers, and are restricted from using mill waters therein described; and the brook at Llandoor to Morris Town, being  $1\frac{1}{4}$  mile, is to be made navigable by the Duke of Beaufort, which,

with the tolls thereon, is to be the Duke's private property, and to be called Morris's canal. The ground allowed for the whole canal is 26 yards wide, towing-path included, and the company are empowered to raise 60,000*l.* divided into 100*l.* shares, and may raise 30,000*l.* if wanted; no person to hold above 20 shares, and it is to be completely finished in 4 years. There are several rail-roads and collateral cuts permitted to be made in certain places, and denied at other specified places, and inclined planes may be made and preserved. This canal goes through a country like the last, plentiful in all kinds of ores and minerals, lime-stone, coals, &c. to the great enrichment of the land owner, and useful to the country in general.

#### GLAMORGANSHIRE CANAL. 1796.

The preamble states, that by an act of the 30 Geo. III. cap. 82, for making and maintaining a navigable canal from Merthyr Tidwell, to and through a place called the Bank near the town of Cardiff, in Glamorganshire, several persons are incorporated by the name of the Company of Proprietors of the Glamorganshire Canal Navigation, and are authorised to make the canal, and to raise any sum not exceeding 90,000*l.* and as the company have expended that sum in carrying on the canal and its works, but find it will require a further sum to enable them to complete the same, and as the company are extending the canal from the Bank to the Lower Layer, which extension will be of public utility: it is enacted, that the company may cause the extension of the canal to be completed, and defray the expense thereof out of the money to be raised by

virtue of this and the recited act, which empowers them to raise among themselves the sum of 10,000*l.* on the same interest, and in proportion to the number of shares they are possessed of in the undertaking; and the money so to be advanced and raised shall be applied to the completing the extension of the canal, viz. for erecting flank walls on each side of the tide lock to secure the same from the damage of the sea, for completing the weirs, sluices, flood-gates and tumbling bays, for erecting cranes and wharfs, for building lock-keepers' houses, for feeders, bridges, and locks, and additional sills and securities to lock-gates, for lining, puddling, and making the canal water tight, for compensation for land, and completing towing-paths, and fences, deepening the canal from the south gate to the sea, and for superintending the said works. The several works aforesaid, and the extension and all other works incident to the canal shall be finished in two years after the passing of this act, beyond which time no money shall be applied.

If the company shall find it necessary to raise a further additional sum, they may contribute among themselves a sum not exceeding 10,000*l.* but on such last mentioned sum the clear profits shall never exceed 5 per cent. and the company shall keep in proper books a distinct account thereof, the times when and by whom advanced, and how the same shall be applied. And this act shall be deemed a public one.

N. B. There are, as usual, the navigation clauses; and only one private clause in favour of the Marquis of Bute's lands.

MONMOUTHSHIRE CANAL, TO EXPLAIN AND AMEND.  
1797.

The preamble states, that by an act of 32 Geo. III. cap. 102, for making and maintaining a navigable canal from some place near Pontnewynydd into the river Usk, at or near the town of Newport, and a collateral cut or canal from the same, at or near a place called Cryndau Farm to or near Crumlin bridge, all in the county of Monmouth, &c. certain persons were incorporated to make and maintain the canals therein mentioned, and the company were thereby empowered to raise among themselves 120,000*l.* to be divided into 1,200 shares of 100*l.* each, and in case the 120,000*l.* should be insufficient, they were empowered to raise 60,000*l.* more; and as the company have proceeded in making the canals, which are now in a state of great forwardness, and they have raised and expended the 120,000*l.* and have found it necessary to raise the 60,000*l.* among themselves, and 35,000*l.* has been contributed to it accordingly; and as the company having originally subscribed only 108,000*l.* for carrying on the undertaking, afterwards subscribed 12,000*l.* in order to make up 120,000*l.* rateable according to the sums originally subscribed; and they also subscribed the further sum of 60,000*l.* by means whereof most of the company have subscribed different fractional parts of 100*l.* which may be productive of inconvenience in the distribution of the profits; and as it is found that what remains to be paid of 60,000*l.* will not enable them to finish the undertaking; and as there may not, in the course of time, be a space sufficient for wharfage and other necessary accom-

modation on the north side of the Pill at Newport, the company are desirous of being enabled to extend the canal, which at present terminates near Newport, across the Pill, and through certain lands in Newport, and in the parish of St. Wollas, if found necessary, to within 10 yards of the extent of the Cinder Hill and Friar's Fields, and under the restrictions hereafter mentioned, to the further distance of about  $1\frac{1}{2}$  mile beyond the termination of the canal; and it hath been estimated that the expense of completing the original undertaking, and of extending the canal, will amount to 44,613*l.* 6*s.* 8*d.* It is enacted, that the company of the Monmouthshire canal may make and maintain a canal from the end of the canal on the north side of the Pill as aforesaid, and also may make and set up towing-paths, bridges, locks, reservoirs, tunnels, aqueducts, wharfs, cranes, and other conveniences, as may be necessary; and they shall finish the extended canal agreeably to the plan delivered to the clerk of the peace for Monmouthshire, previous to the passing of the act, and the extended canal shall be of sufficient width to enable three barges conveniently to lie abreast of each other, and not exceeding 45 feet broad, and shall not deviate more than 20 yards from the line described in the plan.

The company may raise among themselves, in manner hereafter mentioned, 34,600*l.* which, with 120,000*l.* and 60,000*l.* already contributed, will make up 214,600*l.* and every proprietor who shall be possessed of one or more shares in the navigation shall contribute, when called upon, 16*l.* 13*s.* 4*d.* in respect of every share he possesses, towards raising 34,600*l.* and every proprietor who shall by virtue

of such contribution of 16*l.* 13*s.* 4*d.* and of his former contributions, be possessed of any fractional part of a share of 100*l.* shall contribute when called upon such further sum as will make up such fractional part a whole share, in order to complete 34,600*l.* and the 214,600*l.* so to be made up, and also the navigaton, shall be considered as divided into 2146 shares, and shall be numbered in regular progression, and shall be deemed personal estate, and transmissible as such.

The sums of 12,000*l.* and 7000*l.* (being the estimated expense of making the rail-roads to Nanty-Glo works, and to the collieries, and also 5000*l.* for the purpose of extending the canal, shall not be appropriated to any other uses, unless it shall be ordered so by a half yearly general meeting.

The committee of the company may, after the expiration of one month from the passing of this act, make such calls for money from the persons who shall be liable to contribute towards the sum of 34,600*l.* as they shall find necessary, so that no call shall exceed 10*l.* per cent. and not less than one month from each other.

If the 34,600*l.* shall be insufficient, the company, after an order shall be made at any general or special meeting, may raise among themselves any further sum not exceeding 10,730*l.* which sum shall be paid by the proprietors proportionably, according to the number of shares they possess; and the same shall be paid to the treasurer at such time and place as shall be appointed by such general or special meeting, or by the committee, of which such notice shall be given as by the recited act is required. And this shall be deemed a public act.

N. B. The numerous clauses in this long act for the securing private property, and allowing private accommodations to the land-owners, will convince the reader of the care that is taken by the Legislature of every individual's interest, as well as their attention to the customs and duties belonging to government. The immense sums raised, and to be raised for this undertaking, prove it to be of the utmost advantage; and when we consider the inexhaustible contents of the bowels of the earth, and neighbouring mountains of mines and minerals, which for ages have lain concealed, it is no wonder the land-owners exert themselves to complete this canal navigation, for the conveyance to market of the ponderous articles made therefrom, and which could not be sent by any other method: the usual clauses in all navigation acts are also inserted.

MONMOUTHSHIRE CANAL, TO AMEND. 1802.

The preamble states, that by an act passed in the 32 Geo. III. certain persons therein named were incorporated by the name of The Company of Proprietors of the Monmouthshire Canal Navigation, and were authorised to make and maintain the navigable canals mentioned in the title of the said act, and the several rail-ways therein mentioned from such canals, to certain iron-works in the counties of Monmouth and Brecknock, and also such other rail-ways from any of the said canals and rail-ways as the act specified, to any other iron-works then or thereafter to be established, or to any lime-stone quarries, or coal-mines, within the distance of eight miles therefrom, as the said company shall think proper; and to erect and make such wharfs, quays,

landing-places, and other works and conveniencies as should be thought requisite. And by another act of 37 Geo. III. for extending the Monmouthshire canal navigation, and for explaining and amending the last recited act for making the said canal, the said company were empowered to make and maintain a navigable canal, from the termination of the canal made in pursuance of the first act, on the north side of the Pill at Newport, towards a place called Pill-Gwenlly (in the said act by mistake called Pingwelly) at the distance of about a mile and a half therefrom; and to make such wharfs, quays, landing-places, and other conveniencies adjoining or near thereto, as might be requisite.

And whereas the said company of the Monmouthshire navigation have made considerable progress in the execution of the said acts, and have raised and contributed among themselves the several sums of money which by the said acts they were empowered to do for the purposes aforesaid, to the amount in the whole of 224,385 *l.* and the said company find that a further sum of money is wanted to enable them to complete their undertaking, and to discharge the debts incurred by them; and whereas it is proper and expedient that a rail-way or tram-road should be made from Sirhowy furnaces, in the parish of Bedwelty, Monmouthshire, along by certain extensive iron-works, projected and now erecting in the same parish, and intended to be called Tredegar iron-works, through Tredegar Park, to communicate with the canal belonging to the said company, and the river Usk, at or near the town of Newport, together with certain branches of rail-way or tram-



road, from and out of the last mentioned rail-way or tram-road to other places : and Samuel Homfray, Richard Fothergill, Matthew Monkhouse, William Thompson, and William Forman, iron-masters, and intended lessees of the Tredegar iron-works, have proposed to the said company to undertake the making, at their own expense, of so much of the said rail-way or tram-road from Sirhowy furnaces as shall reach to the Nine Mile Point, being nine miles from the lands of John Jones, esq. lying near Pill-Gwenlly aforesaid, upon having the benefit of the tolls thereof ; and Sir Charles Morgan, of Tredegar, bart. has proposed to the said company to make, at his own expense, one mile of the said rail-way or tram-road, through Tredegar Park, now belonging to him, on having the benefit of the tolls to arise thereon ; and the company are willing to undertake making the remainder of the said rail-way or tram-road.

And whereas it is expedient that the said recited acts of the 32 & 37 Geo. III. should be explained and amended : Therefore be it enacted, that the said parties before recited, iron-masters, shall for that purpose be one body politic and corporate, by the name of The Sirhowy Tram-road Company, and the said Sirhowy tram-road company are hereby authorised, from and after the passing of this act, to make, and for ever after to maintain, a sufficient rail-way or tram-road for the conveyance of iron, coals, limestone and other commodities, in waggons or carriages constructed for that purpose, from Sirhowy furnaces or iron-works, along by Tredegar iron-works down to Nine Mile point, near Pill-Gwenlly aforesaid, together with all such collateral roads as

turns out, and all such landing-places, resting-places, fences, and other conveniencies, as they shall find necessary, and to have and enjoy the like ways, passages, powers, and authorities, upon and through all lands on or in which such rail-way or tram-road shall be made, in as full and ample manner as the Monmouthshire canal navigation company are authorised to have, exercise, or enjoy, by virtue of the recited act; and the said Monmouthshire canal navigation company are hereby fully empowered, from and after the passing of this act, (and now reciting the last tram-road company) to make a like rail-way or tram-road, branching off from the other rail-way or tram-road, between the Nine Mile Point and Tredegar Park, at a place called Risca, upwards, and to communicate with the present rail-way at Crumlin, in Monmouthshire; and a like rail-way or tram-road, branching off from the said intended rail-way or tram-road, between Tredegar Park and Newport, at or near Court-y-Billa Farm, to near Pill Gwelly aforesaid, on the river Usk, below the town of Newport, together with such other branches of rail-way or tram-road, from out of the said intended way or road between Tredegar Park and Newport, as may be found expedient, unto the different wharfs between Pill and Newport, and with all such collateral roads as turns out, and all such resting-places, landing-places, fences, and other conveniencies, as the said company shall find necessary or expedient to promote the carriage and conveyance of goods thereon.

And the said rail-ways or tram-roads to be made by Sir Charles Morgan through Tredegar Park, and the tram-road to be made by the Sirhowy tram-road company, shall be completely finished by the 29th

of September, 1803, and the Monmouthshire canal company are engaged to completely finish their part of the tram-road, agreed to be done by them, by the 29th of September, 1803, and to keep the same in repair for ever, or the act to be void.

And the said Sirhowy tram-road company are hereby authorised, with the consent of his Grace the Duke of Beaufort, to make and maintain a rail-way or tram-road, branching off from the said rail-way or tram-road at or near Tredegar iron-works, unto the lime-stone rock or quarry at Trevil, in the parish of Llangunider, in Brecknockshire, and also a rail-way or tram-road branching off from the same at Nantybwch, unto the union iron-works in Rumney, in the same parish, together with such collateral roads as turns out, and other conveniencies; and maps, or plans, and books of reference, with the line of the different rail-ways or tram-roads, are deposited with the clerks of the peace for the counties of Monmouth and Brecknock, and with the clerk of the company, which are not to be deviated from more than 200 yards; and both the said companies may make wharfs, and build warehouse cranes, weighing-beams, engines, or other works, on any land or place they shall deem necessary and expedient, and enter with workmen to keep the same in repair, making satisfaction for the same.

And whereas the sum of 213,700 *l.* part of the said sum of 224,385 *l.* in the former acts mentioned, have been divided into 2,137 shares, of 100 *l.* each, and the sum of 10,685 *l.* residue of the sum of 224,385 *l.* having been contributed by the proprietors of the said 2,137 shares, in proportion to their number of shares, such 2,137 shares became in-

creased to 105 *l.* each, and it is expedient that the shares in the said undertaking should consist only of 100 *l.* each: Be it enacted, that the additional sums of 5 *l.* each shall, as soon as conveniently may be after the passing of this act, be deducted and taken from the said 2,137 shares, so as to reduce the same to 100 *l.* each; and that the several sums of 5 *l.* shall be thrown together, and formed into additional shares in the said undertaking of 100 *l.* each, so far as the same will extend.

And in order to enable the Monmouthshire canal company to complete their original undertaking, as also to make the rail-ways or tram-roads, and other works, and to discharge the debts incurred by them: Be it enacted, that the said company may raise the sum of 50,000 *l.* more, by new subscriptions by one or more sums of 100 *l.* each, and to be entitled to all the profits and advantages as original subscribers; or the whole or any part of the 50,000 *l.* may be raised on mortgage: and the Sirhowy company agree to pay 110 *l.* yearly for the remainder of their lease of 99 years, to the Monmouthshire canal navigation company, and the Sirhowy tram-road company are hereby authorised to raise the sum of 30,000 *l.* among themselves, to enable them to finish the said rail-ways or tram-roads, in 300 shares of 100 *l.* each; and if the said sum is insufficient, they may raise 15,000 *l.* more, either by themselves, or admission of new subscribers, or on mortgage. And this to be taken and deemed a public act.

N. B. The very long and tedious explanation of this act, in 52 clauses, is so complex in providing for the separate interests of the two com-

panies, that it is difficult to express it intelligibly, and tautology could not well be avoided. The clauses to secure private property, and to prevent disputes with the companies, are many and very long, but no doubt remains that it will be a valuable speculation.

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## SCOTLAND.

### FORTH AND CLYDE CANAL.

THE usefulness in joining the Forth and Clyde was long ago known, and the scheme was under consideration in the reign of Charles II. but that reign was not famous for those kind of improvements; it then lay dormant till 1723, when it was revived, and a survey made by a Mr. Gordon, but was again unnoticed on account of the greatness of the expense. A Mr. Mackell was employed in 1762, by Lord Napier, to make a survey and an estimate of a canal, which should quit the Clyde at Yocker Burn, five miles below Glasgow, and join the river Forth about two miles from the mouth of the Carron river. From the favourable report to the board of trustees for encouraging fisheries, &c. in Scotland, by Mr. Mackell; they employed Mr. Smeaton, the most famous engineer of his time, to make a survey in 1764, but the expense of his estimate appeared too great for the trade to make adequate payment of the money to finish the work.

Two gentlemen, Mr. Watt and Mr. Mackell, were now employed to contrive a small canal from Glasgow to the river Forth. Their survey and esti-

mate were published in 1767. The country land-owners and gentlemen not liking a small canal to finish at Glasgow, Mr. Smeaton was again called in to examine the ground, and to survey and estimate for a large tanal that would carry coasting vessels across from sea to sea ; judging properly that such a canal would increase and create a great trade between the west coasts of Great Britain and Ireland.

In such large undertakings as these, difference of opinions must be expected where numbers are concerned, and this was the case of this second survey of Mr. Smeaton, when it was thought proper, in such an immense undertaking, to call in other advice. Application was therefore made to Messrs. Brindley, Goldborne, and Yeoman, who surveyed the same, and gave their opinion thereon, which was reviewed by Mr. Smeaton afterwards, and he so completely refuted the arguments and observations of those three engineers, that the trustees and proprietors were fully sensible of his superior abilities, and they unanimously put the whole under his direction. A subscription was immediately opened, and an act of parliament obtained to carry this most useful object into execution.

It is here proper to give a short abstract from Mr. Smeaton's report to the honourable trustees for fisheries, manufactures, and improvements in Scotland, relative to the expense of uniting the rivers Forth and Clyde by a navigable canal.

Mr. Smeaton's report begins with observing the great utility of navigable canals in general, and then observes, that a communication by that means between the East and West Seas, has occasioned the forming many contrivances for this purpose in several

parts of Great Britain ; for instance, the uniting the Thames with the Severn ; the Trent with the Severn ; the Trent with the Weaver ; the Calder with the Mersey, and the Forth with the Clyde : but, says he, I am well convinced that the last is by far the easiest to be completed, both in point of distance and perpendicular height ; and it is remarkable that, although the country about this place lies as high or higher than the rest, yet through this high ground there happen to be two natural different passages, both lower than any of the others, and both appear equally practicable, and upon ocular surveys, it has been doubtful which of the two has the preference.

One of these passages is from the river Carron, by the water of Bonnie, through the bog of Dolater, into the Kelvin, and from thence into the Clyde, by the way of Yocker Burn. The other is by following the river Forth, some miles above Stirling, and then crossing over through the bog of Bollat, into the water of Enrick, down to Loch Lomond, and from thence by the river Leven, into the Clyde, at Dumbarton ; and as I have, by order of the honourable trustees for fisheries, &c. been at some pains to make proper observations for determining which to prefer of these two passages, I shall first endeavour to settle this question, and then proceed to explain the leading points that occur in laying out the preferable tract.

From the Forth, about three miles up the river Carron, to Carron shore, there is now a good navigation for sea vessels at spring tides, drawing from nine to ten feet water, and from seven to eight feet at neap tides, which, from the cuts proposed to be made

across the loops, is likely to be improved ; and so far I consider the present sea navigation to extend. From Carron shore to Tophill, a little below Camelon bridge, the ground is gently rising, and very suitable for a canal ; from thence to above Camelon, between New Hall and Glenfour, the ground rises 60 feet in half a mile, and is more uneven, but not attended with any great difficulty ; from thence the canal may be continued upon the decline of the high ground, so as to run on a dead level to Castle-Cary bridge, being four English miles. This tract of ground is intersected with haughs and burns, which are frequent, and will require considerable expense in banking, aqueducts, and other extra works, yet nothing appears but a reasonable charge will conquer. The chief single work will be an aqueduct bridge, in crossing Bonnie Mill burn, near Bonnie bridge, over which the canal must be carried by arches ; another, but of a less kind, is required in crossing the river Bonnie, at Castle-Cary bridge ; from thence by the bog of Dolater, which begins a little above Wineford, the passage is easy, by a gentle ascent, and through the bog which extends to Craigmarline woods, there are only four feet descent either way in the extent of two miles, about the middle of which is the summit between the two seas, and which is elevated above high water at neap tides at Carron shore, 147 feet, being distant from it nine English miles. On each side of Dolater bog the country rises high, affording much water on the least rain from various springs and rills ; but the principal source is the burn of Auchinclough, which discharges itself into the bog, and though it now runs into the water of Bonnie, could with little trouble be



turned into the Kelvin. There is a drain in the middle of the bog, half a mile in length, that is level, and runs neither way, and which is the head of the Bonnie and the Kelvin. This bog is more properly a peat moss or morass, and chiefly half a mile broad, but contracted at each end to about 120 yards, so that it is well adapted for reservoirs, canals, and water passages; in fact the whole bog might be easily put under water by a dam between the high grounds at each end.

From the summit or point of partition westward, the Kelvin runs in an open valley for 13 miles, upon a regular and insensible decline to Garscud bridge, where it begins to be rapid, and runs through a deep channel, confined by rocks and precipices, down to Partrick, where it falls into Clyde. Of this part it is not impossible to be made navigable, but it would cost a great sum to make a bad navigation, for this reason those who have turned their thoughts this way, have sought out a new passage into Clyde, and nature having pointed out two that are practicable, one by the valley of the Allender, leaving Douglaston, Kilmardony, and New Kirk Partrick on the right, and cutting through a rising ground between the two last places, into a valley leading to Grascaddon; the other passage leads out of Kelvin valley, above Garscud bridge, and going by Canny's Burn, crosses a rising ground, and falls into St. Germain's Lock; and from thence by the same valley as the former to Grascaddon; both these passages have their difficulties, by reason of the ground to be cut through, 30 feet perpendicular above the general level, yet both are preferable to the passage of the Kelvin, below Garscud bridge.

which, besides the before mentioned difficulties, is filled with mills of various kinds : at Grascaddon, the ground falls much in a short space, and then the passage is easy to the Yocker burn, which discharges itself into the Clyde, nearly opposite Benfield, and a little above a place called the Barns of Clyde ; from hence downwards, the Clyde is navigable at all tides, with any vessels that can be expected to navigate upon the intended canal, which vessels I would propose to be such as may be able occasionally to go from Port Glasgow or Greenock to Leith.

From the point of partition of the waters in Doler bog to the Barns of Clyde, by the course of the canal, is 18 miles, English measure, so that 27 miles is the whole length.

I shall omit describing the passage by the way of Loch Lomond, and only notice the difference of length, rises and falls of water, and expense, which is the reason of the other being preferred to this.

The passage by Loch Lomond measures by the course of rivers, &c. from Dumbarton through Loch Lomond to Alloa, near Stirling, by the loops of the rivers, 73 miles, and it further appears, that by the most direct passage that can be made, it will be 40 miles at least, consequently there will be a difference of 13 miles in favour of the first described canal.

By careful and particular investigation, it is proved that the Loch Lomond passage will cost 2,500*l.* more than the Carron passage, that it is 40 miles further about, and will also be more loss of time in passing, and more expense in keeping between 30 and 40 more locks in repair.

To give more particulars of the Carron passage, and method of supplying the canal with water pro-

per for the navigation, would be tedious and unnecessary; I shall go on without noticing the burns and haughs, to pass to the number of locks, their expenses and situations.

|                                                                                                                                                                             | No. of<br>Locks. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| From Carron shore to the level of the intended canal above Camelon bridge, rise 108 feet, which, at 4 feet each, require .....                                              | 27               |
| From thence to Castle-Carey bridge the canal will be on a level, and needs none, but from thence to Redburn is a rise of 16 feet, which, at 4 feet each, will require ..... | 4                |
| From Redburn into the canal of partition is 21 feet, which, at three feet each, will take ..                                                                                | 7                |

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 38
 

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From the canal of partition to Inchbelly bridge, the fall is 36 feet, which, at three feet each, requires .....

12

From thence to the Clyde there remains 109 feet, this, at four feet each, will require .....

27

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 39
 

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The number of locks in the whole is 77.

The above mentioned is the utmost number of locks that can be wanted, for if it should appear in completing the work that the supply of water should turn more affluent, or a less number of vessels be expected to navigate than I have supposed, then some expense may be saved by making the rise at the locks greater in general, and with a strict equality,

by which means they may be made more readily to suit the ground ; it must, however, be observed, that the highest lock determines the quantity of water to be used, for if there were but one lock of eight feet in the whole number, this would lose as much water as if they were all of the same height, unless an extra supply could be brought to this lock to place against the extra quantity.

Wherever the canal is held by banking above the surface of the adjacent land, back drains must be cut behind such banks to receive the leakage that otherwise might damage the soil, and conduct the same to a common water-course ; and also to lay tunnels under the bottom of the cut, to communicate with such water-courses across the same as require to be preserved, or whose elevations may not suit to be brought into the canal ; also to make bridges over the canal in proper places for communication between such properties as shall be divided from the same, and to make gates on the towing-paths between every fence, and double gates, if required, for the divisions between different properties, with overfalls at proper places for discharging the surplus water, and whatever else shall appear to be necessary, for preserving the property of every person as near as possible in the same state as before the execution of this work.

The breadth of the canal is proposed to be 24 feet at the bottom, and the sides to be sloped at a medium in the proportion of five to three, that is, to every three feet deep to widen five feet on each side, to have five feet depth of water, and to be seven feet deep within soil at a medium, so that its width at the surface of the water will be 40 feet eight

inches, and to be made wider at proper places and distances for vessels to pass each other.

It is intended to make the canal less for boats of  $17\frac{1}{2}$  feet wide ; drawing four feet water, would make them draw hard, and to make it larger would incur an unnecessary expense. The locks I would propose not to exceed four feet each in rise, in order to save water in working them ; being made with less rise would be troublesome, on account of the number only between Redburn and Inchbelly bridge ; as water may be there more scarce, I have therefore proposed them to be there only three feet each rise.

I come now to consider the expense of making the canal.

The canal being 24 feet mean width at bottom, and seven feet mean depth, with slopes as five to three, the width at top will be 48 feet, and the mean width being 36 feet, will be 28 cubic yards in each running yard, and in a mile 49,280 cubic yards digging, which, at 3*d.* per yard, is 616*l.* per mile, and for 27 miles in length, it comes to ..... £16,632

Extra digging in the canal of partition to make it 50 feet at bottom, 53,308 yards, at 3*d.* per yard, is ..... 667

Extra work in making passing-places and additional measure for turning angles, we may allow in the whole one mile ..... 616

The canal being 48 feet at top, allow the same width for the banks on each side, that is 48 yards in breadth over all, which

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Carried forward .... £17,915

|                                                                                                                                                                                                                 |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Brought forward . . . .                                                                                                                                                                                         | £17,915 |
| makes in one mile 84,480 square yards,<br>which is 15½ Scotch acres nearly, and for<br>27 miles 418½ acres, and which, supposing<br>them to be purchased at a medium at 20%<br>per per acre, comes to . . . . . | 8,370   |
| Besides what is immediately occupied<br>by the canal and its banks, land will be<br>wanted for trenches, reservoirs, &c. &c. which<br>may amount to 20 acres in the whole . . . .                               | 400     |
| The number of locks being 77, at 400 £<br>each, comes to . . . . .                                                                                                                                              | 30,800  |
| To extra digging in passing a narrow<br>gripe between two rising grounds, a little<br>south-west of Mungulshouse . . . . .                                                                                      | 100     |
| To extra digging through the summit of<br>the ground between Glenfour and New-<br>hall, above Camelon . . . . .                                                                                                 | 100     |
| To extra banking across six haughs, or<br>hollows, between that place and Bonnie<br>Mill, at 100 £. each on an average . . . . .                                                                                | 600     |
| To an aqueduct bridge to pass Bonnie<br>Mill burn, and extra banking to the same,<br>with an overfall to discharge the surplus<br>water of the canal . . . . .                                                  | 1,000   |
| To extra work in passing Seabeg's Wood,<br>Trannock Burn, Acre Burn, and other<br>haughs and risings from thence to Castle-<br>Careys bridge . . . . .                                                          | 400     |
| To an aqueduct bridge for passing the<br>river Bonnie, near Castle-Carey bridge, and<br>extra embanking there . . . . .                                                                                         | 800     |

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Carried forward . . . . £60,485

Brought forward . . . . £60,485

To a shuttle for taking in water as occasion may require, from Redburn, and an overfall to discharge the surplus water . . . . 20

To two miles trenching in bringing Kilsyth Burn, together with Shien Burn, into the canal of partition, which, at 1s. per yard, comes to 176 l. and allowing 74 l. for extra cutting, with some small tunnels and bridges that may be wanted under and over the same, together with a shuttle and overfall for taking in and discharging the superfluous water, will come to . . . . . 250

To building a dam or weir across the Kelvin, below Inchbelly bridge, with proper shuttles to draw off the water . . . . . 500

To building such another dam below Calder bridge . . . . . 500

To an aqueduct bridge for crossing the Allender river, and extra embanking there . . 300

To extra work in piercing and vaulting a passage through the high ground between Canny's Burn and St. Germain's lock . . . . . 1,200

To extra work in passing Grascaddon . . 100

To extra work in making a jetty for defending the mouth of the canal, and clearing the passage into Clyde river . . . . . 150

To five public road bridges, viz. at the road from Falkirk to Carron, at Camelon, at Castle-Carey, at Canny's Burn, and at Yocker Burn, 100 l. each . . . . . 500

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Carried forward . . . . £64,005

|                                                                                                                                                       |         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Brought forward . . . . .                                                                                                                             | £64,005 |
| To 21 bridges where the lesser roads intersect the canal, at 75 <i>l.</i> each . . . . .                                                              | 1,575   |
| To 28 private bridges to communicate between lands, making, with the public road bridges, two in a mile on an average, at 50 <i>l.</i> each . . . . . | 1,400   |
| To 13 large tunnels for carrying the lesser brooks under the canal, at 40 <i>l.</i> each . . . . .                                                    | 520     |
| To 68 small tunnels for preserving water courses, together with the large ones, 3 in a mile on an average, at 10 <i>l.</i> each . . . . .             | 680     |
| To making towing-paths, back drains, gates, towing-bridges, &c. at 20 <i>l.</i> a mile . . . . .                                                      | 540     |
| To bringing the water of Enrick from a little above Randeford into Carron . . . . .                                                                   | 150     |
| To bringing the burn of Ballagin, with some other springs westward of Ballagin, into the Kelvin . . . . .                                             | 100     |
| To temporary damages to lands and mills, unforeseen accidents, impediments, and works, engines, utensils, and supervisal . . . . .                    | 10,000  |

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Sum total . . . . . £78,970

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In order to estimate the amount of the tonnage by which the expense is to be reimbursed, I examined the ga-boats which ply upon the Clyde, and are capable of navigating that river at all seasons, and which by the same rule would navigate the Frith of Forth, between the canal and the port of Leith, if required, I found that a middling ga-boat of 56 feet, keel  $17\frac{1}{4}$  feet wide, and drawing four feet



water, will carry 40 tons, and this I look upon to be the largest size that will be convenient for this navigation. Now suppose 20 of these boats on an average pass in a day in the driest seasons, that is ten each way, and supposing them to go full loaded from the Forth to the Clyde, and half loaded back from Clyde to Forth, they will carry 600 tons of goods per day, being 4,200 tons per week of seven days, for though the boats should not work on Sundays, yet, as the water will be gathering, the capacity of carriage in point of water will not be diminished, which will be the case although they do not go regular; but casting off the 200 tons for accidents and disappointments, and reckoning only 4,000 tons per week, that will amount to 208,000 tons per year, exclusive of what may further be done when the supply of water is unlimited; the lock duty, exclusive of freight, would, I apprehend, bear 5s. per ton, but say only half-a-crown, 208,000 tons would amount to 26,000 *l.* a year. From hence I would infer, that if we could furnish water in dry seasons for 20 boats a day, that will be water enough, at the lowest tonnage that can be supposed, to raise a much greater annual sum than can be wanting for repairs, and to discharge the interest of the capital to be expended, and in all probability more water than the trade will want. But I would not have it inferred from hence, because the canal can carry 208,000 tons a year, that there will be 208,000 tons to carry, the price of tonnage therefore must be fixed according to the probability of carriage, which it is proper to leave to the decision of those who are better skilled in the trade of this kingdom, and especially the particular trade of these parts.

On further considering the subject of the foregoing report, Mr. Smeaton is of opinion it will be eligible to carry Redburn into the canal of partition, not as an assistant in case of need, but to be applied in the first construction, the charge of which will be amply recompensed by the omission of 5 locks between Redburn and Inchbelly-bridge, for the 3 feet locks proposed in that district may then be 4 feet, the same as all the rest, and it will appear by what has been said before, that the water expended on the whole will be precisely the same, so that then the number of locks will be 36 each way, and 72 in the whole.

Mr. Smeaton has contrasted the canal of Languedoc in France with that of the Forth and Clyde, as follows—

As the noblest work of this kind that ever has been executed, the royal canal of Languedoc, has been generally esteemed as not to answer the expense, this will undoubtedly be made an argument against the present proposition; I shall, therefore, oppose some matters of fact relating to the French canal, by way of parallel.

|                     |                              |
|---------------------|------------------------------|
| CANAL OF LANGUEDOC. | CANAL OF FORTH AND<br>CLYDE. |
|---------------------|------------------------------|

Length of the canal between Port-de-Cettee on the Mediterranean and Thoulouse is 152 English miles, besides a river navigation from Thoulouse to Bourdeaux above 100 miles more, so that the

Length of the canal between Carron shore and the Barns of Clyde is 27 English miles. Sea vessels go up to the Carron shore and to Dumbarton, the distance of which by the canal will be 33 miles;

whole length of inland navigation is above 250 English miles between the two sea-ports.

Suppose the vessels to make way at an average of  $1\frac{1}{4}$  mile an hour, the passage will take 14 days, of 12 hours each.

The perpendicular height of the point of partition is 639 English feet above the two seas.

This canal is navigated by 100 locks of above 8 feet rise each.

The expense of this undertaking has been 612,500*l.* sterling.

This work is still incomplete by reason of the shoals in the river Garonne, below Thoulouse, which in dry seasons greatly interrupt the vessels; to carry the canal below which, as the only remedy, it is estimated will cost 43,750*l.*

but reckoning from Port Glasgow to Leith, the distance will not exceed 70 English miles.

Suppose the vessels to make way at an average of 1 mile an hour, the passage will be but 4 days of 12 hours each.

The perpendicular height of the point of partition in the proposed canal is only 145 feet.

This canal is to be navigated by 77 locks of between 3 and 4 feet rise each.

The expense of this undertaking is estimated at 78,970*l.* sterling.

This canal falls into the rivers Carron and Clyde in the tides way, at places where there will be no obstruction to the vessels proposed to navigate the canal in the driest seasons at high-water, and from whence they may proceed on their voyage to their sea-ports.

Now if it may be admitted that as great a trade is likely to be carried on between the Forth and Clyde, where the sea navigation is long and dangerous, and the inland short and easy, as between the Gulf of Lyons and the Bay of Biscay, where the sea navigation is open at all times, though long, and the inland navigation tedious, and sometimes almost impassable, for want of water, over the shoals in the river; the inference is plain, viz. that the same tolls which will hardly keep the French canal in repair, will make this a very beneficial undertaking to British adventurers.

In a former part of this work I mentioned a writer who was still an advocate for a river navigation between the rivers Forth and Clyde, notwithstanding every argument from theory, and proof from practice, of its disadvantages, and as I there promised to give some account of what this writer said in its favour; it cannot be inserted in a more proper place than the present, but as the publication is to be bought, and relates only to this navigation, I shall be as explicit as possible, referring the curious or those that are particularly interested to the pamphlet itself as being entirely local, yet of considerable merit and acute reasoning: it is entitled "Reflections on Inland Navigations, and a new method proposed for executing the intended navigation between the Forth and the Clyde, in a complete manner, and at an expense one third less than what that work has been estimated at." It is addressed to the noblemen and gentlemen subscribers for forming a navigable canal to join the Forth and Clyde, at whose desire it was composed, by J. Gray, 1768.

"It must give," says this writer, "a singular pleasure to every well-wisher to Great Britain to see so much attention at present bestowed upon the forming of navigable canals in different parts of this island, particularly in regard to that for opening a communication for sea vessels between the Forth and the Clyde, which, although not the most difficult in point of execution, is by far the most national and most important. This, as it is now proposed to be executed by the subscribers, will not partially regard a single town, or extend its influence to one or two counties only, but will be a thoroughfare for the east and west coasts of the whole island; nay, even for different nations, for it will in a manner bring Ireland and America on the one hand, and Germany and the Baltic on the other, 300 miles nearer each other; foreigners will therefore be surprised to find this an attempt of private individuals, when the very nature of it renders it an object of the first national importance. Such, I make no doubt, it will appear to our legislature, and that if private funds should fail or prove insufficient, we may expect to see it carried on and completed at the public expense, with the general approbation."

Mr. Smeaton has, with much solidity and discernment, given a distinct and accurate detail of the requisites for completing a navigation by digging an artificial canal from sea to sea; and if that plan should be adopted, I am persuaded that the real expense will be found to differ very little from his estimate; I propose, however, to offer another method which appears to me much more natural, much more simple, to be founded on the plainest principles of hydrostatics, and which would answer every purpose of the

subscribers, in affording an easy and safe navigation of sea vessels from frith to frith, though it would cost considerably less than the plan proposed.

When water is confined on every side it naturally places itself upon a level ; but if any one part of the confining bank be made lower than the surface, the water will immediately descend by that breach, till it meets with some other obstacle, for its gravitation always makes it seek to approach the centre of the earth, and its fluidity gives it an easy opportunity of escaping ; for a declivity in one part affects the whole surface. Let us suppose a quantity of water of an equal depth contained in an oblong vessel, with two sides and two ends, the sides and ends will have an equal pressure upon them, and were the length and breadth to be augmented never so much, yet, if the depth be not augmented, the pressure upon the sides and ends is no more in the greater surface than in the smaller ; for it is an established principle, that water does not press against its banks according to its surface, but according to its perpendicular height or depth. A canal or river made navigable by art is nothing else, between lock and lock, than this oblong vessel ; and the same banks that will contain a small mill-stream 10 feet broad, will suffice to contain a canal 100 feet broad, if the depth of both be equal ; and should an overflowing happen, it is altogether immaterial whether the superabundance of water escapes by the sides or by the end ; nay, by the construction which I shall propose, its escaping by the end is attended with particular advantages ; I think, therefore, that in numberless cases it may be deemed labour thrown away to carry canals along the sides of rivers, at a great expense of digging,

extra banking, aqueduct bridges, tunnels, sluices, &c. when, often at a much less expense, and to a much better effect, the rivers themselves might be made navigable without the least cause of apprehension of any excess of water, as in the very construction of the canal, the danger of an overflowing may be provided against. The great rapidity and violence of rivers during a flood, have, no doubt, been the reasons that deterred the constructors of canals from risking any communication with them ; But although a body of water running down a declivity, being a furious giant overturning every thing before him, yet if this said giant be laid flat on his back he loses all his force and becomes entirely passive, whatever be his size. If they had reflected on this principle, they might have easily seen that they had it in their power, by banks and dams of a certain construction, to bring almost every river, requiring art to render it navigable, to this passive state ; I say almost every river, because direct cataracts and perpendicular water-falls must be excepted. Some other rivers also, consisting of a large body of water, running down a deep descent, ought to be neglected, because it could hardly be expected, that the profit arising from the navigation would repay the expense of making it.

But that is far from being the case of the two small rivulets that have their course in this tract of intended navigation ; they are both very inconsiderable ; are almost dry in summer, and run very gently into the different seas excepting in one place, where one has a cataract that may be easily avoided. The reader who has not an opportunity of viewing this tract upon the spot, may imagine to himself a

narrow valley, running transversely for 30 miles from sea to sea, and bounded on the south and north by high and mountainous ground. The middle of this valley is almost a dead level for 10 miles, and two small brooks that rise there form a straight line by running in different directions into different seas. The currents of those brooks are extremely gentle, for the place where they take their rise has been found by actual measurement not to exceed 147 feet above the level of the sea.

From this account it plainly appears that the question ought not to be about digging an artificial canal, but about banking in two small brooks. So far from being afraid of those two rivulets, I actually consider them as nothing, but regard their channel as the most proper bed and declivity for the canal, a declivity pointed out by nature, which may easily be reduced to so many levels by dams and locks, and which may be banked on both sides, at what breadth we please, without any extra digging or extra banking in their whole course; but, on the contrary, offering us great part of the work already done to our hands. These rivulets, in their course, keep always in the lowermost part of the valley; is it not most natural to take the hollowest part for the course of the canal, rather than carry it over uneven ground, which by being too high in some parts, occasions extraordinary digging, and, by being too low in others, requires extraordinary banking? By chusing the course of the rivulets for the tract of the canal, sluices, tunnels, and aqueduct-bridges are also all superseded and rendered unnecessary, for, instead of turning aside little rivulets or streams, the canal would be the common receptacle of them all, as it



would be so situated as to receive them all, and by its construction could never be incommoded by them. The following of this tract would also be attended with other advantages, particularly there would be no new division or separation of private property, and there would be very little occasion for any change of property whatever, excepting the property of the rivers and their banks, for though the rivulets are inconsiderable, yet in many places there is as much land on both sides of them wasted, as would suffice for ground for the canal, were it even to be 100 feet broad; and surely that waste ground cannot be highly valued by the present proprietors. By placing the canal in the hollow, it would also be easier to improve the ground on both sides of it, which will no doubt soon change its face after the navigation is finished, and become three or four times more valuable than at present; but what is the most material is, that this tract seems by nature most fitted for the course of the canal.

As the two rivulets that run through this valley are very inconsiderable, in proportion to the intended size of the canal, and, as shall be afterwards shewn, can never be dangerous even in floods, I would propose that the hollow valley where they run should be fixed upon for the course of the navigation; and I would form the canal, not by digging for the whole depth, but by two parallel mounds or banks, placed 80 feet asunder the whole way, even at the locks, like two parallel turnpike roads, and raised so high, that the banking and digging put together should include a depth of 12 feet. In forming the canal by banking along the course of the rivulets, we should have, as I said before, great

part of the work already done to our hands, for the rivulets have in many places formed a considerable channel, which they rarely occupy; in others their ordinary surface is one, two, or more feet below the banks, and in others the ground close by the river naturally forms a considerable mound, so that the water might there be kept up 12 feet deep by one artificial mound only. All these natural advantages are so considerable, that I am persuaded they would render the expense of forming the banks one-third less than otherwise.

Let us consider the canal a while as extending from sea to sea without locks, and the two banks sloping in proportion of five to three; it affords us a capacious bed 12 feet deep, 48 feet broad at bottom, and 80 feet broad at top. This gives us a medium breadth of 64 feet, which, multiplied by 12 feet, the greatest depth, gives us 768 feet for the contents of the canal. Let us now compare this with the two rivulets, both in their common state and in their most augmented state; and we shall find that even in the last, they would be entirely absorbed in the canal, and would never overtop its banks. In the end of November 1767, when there was a great deal of water on the ground almost every where, I viewed the Bonnie water and the Kelvin, which were each of them in an augmented state, and, as I was assured, near double their ordinary size; yet even then the Bonnie water at Bonnie bridge was only 10 feet wide and one foot deep; and the Kelvin, at Inchbelly bridge, was 15 feet broad, and a foot and half deep, which gives for the medium quantity of water little more than 16 feet when the rivers were double their ordinary size. Their quantity, then,

flowing in their ordinary state, is only about 8 feet, which is not the 150th part of what might flow in a canal of the dimensions before mentioned upon the supposition of its being brimfull, and the current meeting with no stop or obstruction from sea to sea. It may, however, be said that though the rivers Bonnie and Kelvin be really very inconsiderable in dry weather, yet there is seldom a winter passes that they are not swoln with land floods, which raise them above their banks and overflow the country several hundred yards on both sides. But let those floods be narrowly examined into, and the greatest excess of them computed, by consulting the oldest persons living in the neighbourhood, and I am persuaded it will be found that they have never risen to such a degree, but that they could be contained, with ease, in the channel of the proposed canal.

There was this autumn a great flood in the Kelvin which overflowed the vale in many parts, for a length of 5 or 6 miles, and carried off some quantities of corn that was standing in sheaves upon the field; so great a flood has not happened for many years, yet by marks upon trees at Inchbelly bridge, it appeared that this great flood had not risen more than six feet above the usual level of the river. Its spreading wide over the vale was a proof of the levelness of the vale, and was owing to its not being confined, for exclusive of perhaps 30 or 40 feet in the middle, where lay the thread of the stream, all that great breadth was dead water, which, if the river had been hindered from extending itself, would have been carried off in proportion as the flood rose, by the increased velocity of the stream, without aug-

menting its extraordinary depth perhaps above 6 inches. This great flood then, when narrowly examined, and supposed to be confined between two hills 40 feet asunder, would probably turn out to be a stream not 7 feet deep; but the capacity of the canal I have proposed, which is 12 by 64, is large enough to let a stream four times as great as that pass easily through it, as it is well known to those who are acquainted with the motion of fluids, which increases as the depth increases, and consequently, supposing a flood twice or thrice as great as the late great flood, the canal and the navigation would have nothing to fear from it.

I inquired the height of the greatest floods in the river Bonnie, within two miles of the sea, where it loses its name on account of its junction with the river Carron, and I was shewn by a very old man the mark of the greatest flood in his remembrance, which is about 6 feet above the usual surface, where it was 60 feet wide. But supposing the Bonnie river or the Carron at that time flowed nine feet deep and 60 feet broad, the canal I propose would well afford room for a flood twice as great as that; there does not therefore seem to be the least ground to think that a canal of the dimensions I have before specified, would ever be incommoded or endangered by any flood, on the supposition of the water having a free course through it. But should it be found that the floods are larger than I have computed them, (though the canal would allow room for floods twice as large as those I have mentioned) it is only setting the banks 100 feet asunder, instead of 80 feet, and the danger is provided against, and the canal becomes

more magnificent without any great additional expense, as shall be treated of more hereafter.

As to the banks or mounds, it will be proper not to be sparing of the expense in their first construction, but to make them sufficiently strong and thick, that they may almost appear like the works of nature, and never after to need any repairs. I would advise they should be raised at an average 8 feet above the surface of the ground, and should be 12 feet broad at top, and slope towards the canal in the proportion of 5 to 3. In the forming of them, the very wideness of the canal gives us particular advantages; for four feet depth of earth over the whole bottom of the canal, together with what is dug for making the back drains, will nearly supply earth for completing them; what is wanted may be easily carted from different places in the neighbourhood, as is done in the making of turnpike roads; but it will never be necessary to bring it from any great distance like the materials for roads, because proper earth may be found almost every where, consequently the making those mounds may be pretty nearly estimated, from what has been paid for making the turnpike road to Kilsyth, per mile, as I reckon that both the banks together would amount to about six times as much, deducting one-third for what is already done by nature.

Were the mounds to be constructed of the size and form above mentioned, I am persuaded that no one would doubt of their being sufficient for the purpose intended by them, of confining the two rivers, and all the water that should come from the point of partition or head source, with the other occasional streams that might fall into the channel

in the course of the canal. But to convince the most incredulous, I shall give an instance of a river above 1000 feet broad, navigable even for ships of war, which is confined by artificial mounds, and whose surface is above 10 feet higher than the adjoining ground on both sides. That river is the Thames, which in many places below London, particularly from the Isle of Dogs to the Woolwich marshes, is fenced in on both sides by artificial mounds, though it be there above 1500 feet broad, and the tide during six hours of the 24 is full ten feet above the surface of the adjoining ground.

History, I believe, does not mention when those mounds were first made; but probably without them there would be two hours less tide at London, and the navigation up and down would be more dangerous, as vessels might easily be stranded on the shallow meadows; thus, though the Thames may justly be reckoned one of the first navigable rivers in Europe, it is nevertheless indebted in some degree for its navigation to art.

What has been done at the Thames is an example before our eyes of the easy practicability of what I propose for the present navigation. But besides the Thames there are many other rivers and artificial canals carried above soil, without any inconvenience from soakage or leakage, or any danger to the banks themselves, which by their own weight, and the moisture of the river, soon consolidate into one mass. How many mill streams may be mentioned that are banked on one side! The river St. John in Nova Scotia is banked on both sides, like the Thames, for a great many miles. The New River is conducted to London in many places above soil. The Duke of

Bridgewater's canal is not only supported in many places by an artificial bank, but the bottom of the canal itself is mounted above the natural surface between 30 and 40 feet, and is carried over an artificial mound of earth of that height for several miles together. To conclude, the canal proposed by Mr. Smeaton in both his reports, is intended to be banked in several places, particularly in a hollow, west from Camelon, 18 feet deep, and 210 feet wide at top, where the very bottom of the canal for a considerable way will run 8 feet above the natural surface.

I have hitherto considered the canal as *without* locks, but having explained the form and size of the mounds or banks, and given, I think, incontestible proofs that they would answer all the purposes expected from them, of keeping up the water on the sides without leakage, I shall now describe the lock that is intended to keep it up at the end or transversely.

I propose the breadth of the canal to be divided into three spaces, by two stone piers of ashlar work, 10 feet thick and 80 feet long, built parallel to each other, at the distance of 20 or 24 feet, like the piers of a bridge. The space between these two piers form the lock, by being built up at the upper end 6 feet high, and having flood-gates at both ends. I propose the fall of the lock to be only 6 feet, because that, added to the depth of water, which may be 11 or 12 feet, will require the lower gates to be 18 feet high, which is a size sufficiently large for the convenience of working; and the tops of the piers may be built flat, with a small parapet and a capstan (camp shot is meant) for the men to walk on to work the gates. If the breadth of the lock be 24 feet,

the two outer spaces, from the piers to the banks on each side, will be 18 feet wide each, and it is proposed to shut up those places with flood-gates, 12 or 13 feet high, made to open occasionally, and likewise to have sliding vanes or sluices. Supposing the flood-gates of all the three spaces shut, and that there is no want of water at the point of partition, or upper source, where the chief of the supply will be collected, it is plain that the canal will be quickly filled to the top of those gates and the top of the banks, and if the water continues to run it will soon flow over them; but to prevent that, the sluices of the gates, or the gates themselves, may, by those who reside at the locks, be easily kept open, in the proportion necessary to give a free passage to the superabundant water, without diminishing in the least the quantity once collected into the canal, so that it would be never overflowing, yet it would be always full.

Now let us examine the supplies of water at the point of partition, or head reservoir, to see if we can draw any more use from them than that of filling the canal, and furnishing water sufficient for the navigation. On the supposition that the extent of the navigation on the canal will require annually, as by Mr. Smeaton's second report, 5,333 locks full of water, that by the lock I have proposed will amount to 61,439,616 cubic feet per year, or 168,328 cubic feet per day; as the canal of 80 feet broad has three flood-gates at each lock instead of one, I shall suppose the leakage per day is three times as much as is stated by Mr. Smeaton, or 12 locks full, which is 138,240 cubic feet: reckoning the exhalations in the same proportion as Mr. Smeaton, at one tenth



of an inch per day, (and that is a large allowance) the daily expense in that article, in a canal 37 miles long, and 75 feet broad, at the water line, will be 122,100 cubic feet. As the banks I propose may justly be reckoned as tight as the natural earth, the soakage cannot be supposed more here than in the other canal, unless upon account of the augmented depth, we shall therefore state it at 110,000 cubic feet per day, and the total expense of water per day will stand thus :

|                                            | Cubic feet. |
|--------------------------------------------|-------------|
| Water expended by lockage, per day . . . . | 168,328     |
| Leakage, ——— . . . .                       | 138,240     |
| Exhalation, ——— . . . .                    | 122,100     |
| Soakage, ——— . . . .                       | 110,000     |
|                                            | <hr/>       |
| Total of water expended per day . . . .    | 538,668     |
|                                            | <hr/>       |

To supply this daily consumption, there are six small streams or burns, that may be made to run and empty themselves into the head reservoir at the bog of Dolater, from whence the canal may be amply supplied with water to both extremities; these streams are computed by Mr. Smeaton to furnish, during seven months in the year, 1,842,043 cubic feet per day; for three months to supply 669,678 cubic feet per day, and in great droughts during two months only 254,328 cubic feet per day; consequently, though for near two thirds of a year there would be a great deal more water than is wanted for the navigation, yet during two months it would seem that there would be a great deficiency.

But that all deficiencies may be certainly and amply supplied so as at all times to have a redundancy

of water, if desired, will appear most plainly from the further remarks of Mr. Smeaton : The bog of Dolater, he says, to the extent of 200 English acres, may, by dams at each end, be laid six feet under water, and deducting one foot in depth for exhalations, there would still remain 43,560,000 cubic feet of water, which would supply the deficiency occasioned by the drought for 158 days, or five months. Besides, at Townhead lint mill, about a mile north of the point of partition, and considerably above the level of that, a valley or hollow may, by a dam not 50 yards long, be laid under water four or five fathoms deep, so as to form a reservoir, equal in capacity to that of Dolater. On the south side of the canal the waters of Bishop's loch, and of four others in the neighbourhood, forming together a surface of between 300 and 400 acres, which may be pent up from four to six feet higher than at present, and brought to Dolater bog. Besides these three reservoirs, each of which may contain 43,000,000 cubic feet of water, several other rivulets might be brought to account. He concludes thus, "that were ten times as much water wanting for the canal as what there appears to be, there are evident means of bringing it, and amassing it without putting any strain upon nature."

Since then it is so easy and practicable to have an ample supply of water at the point of partition, I would propose that provision should be made, not only for the daily consumption of 538,668 cubic feet of water, but also for as much more as would be sufficient for turning a mill at the first lock at each end of the point of partition or head reservoir. The fall of the lock would serve for the fall of the

mill; and, supposing a mill at every other lock on each hand, all the way downwards, the same water that turned the uppermost mills would serve to turn all the rest, so that if there were 50 locks on the canal, there may likewise be constructed 50 water mills, if wanted, and without any prejudice to the navigation. The millers of those mills would be the natural keepers of the locks, and as they would always be upon the spot, every land-flood could be easily regulated by them, so as to be imperceptible in the canal, some great floods indeed must be excepted, but such as these do not happen every winter, and when they do, seldom continue above six or seven days, during which time the navigation of the canal would be rendered more difficult. This week's loss, however, may be set against the same time that would probably be lost every winter in the artificial canal by frost, and the account stands balanced; for in frosty winters it may well be presumed, that dead water would be incommoded with ice for more than a week longer than water that has a small current, and which might be made to raise and lower its surface some inches every two or three hours.

The locks and dams which I propose, consisting of two piers and three flood-gates, besides rendering the navigation of the rivulets practicable and easy, and giving the profits of the mills, might also serve as bridges, by laying beams from one pier to another, and from each pier to the adjoining bank; but it must be remembered, that the part between the two middle piers must be made a draw-bridge, to be lifted up to let the vessels pass. It is proposed in general, that every dam shall serve the triple pur-

pose of being a bridge, of lifting the water for the use of the navigation, and of containing it for the use of the millers."

The above extracts appear sufficient to explain the plan, and state the principal arguments of the writer. Those who wish for a more full account may consult the pamphlet itself,\* but its being of a local description, and perhaps would answer no other place in this country, I thought it unnecessary to proceed further; I shall, however, describe his estimate and expense of completing the canal according to his proposed plan, but in as short terms as possible.

The length of the canal will be about 37 miles from the mouth of the Carron to below Dunbuckford, on the river Clyde, with a side branch to Glasgow, and its breadth from the outside of one back drain to the outside of the other, 120 feet, consequently it will occupy in the whole 452 Scotch acres; but it must be remembered, that great part of this tract is waste ground on both sides of the rivulets, and instead of being of any profit to the owners, often brings damages to them, consequently the parting with it would render the remainder more valuable.

The real ground to be valued for the canal therefore would probably not exceed 300 acres, which, at 20*l.* an acre, is . . . . £ 6,000

Carried forward . . . . £ 6,000

\* Printed for T. Cadell, in the Strand, 1768.

Brought forward . . . . £ 6,000

Supposing 100 acres more be allowed  
for reservoirs, that at 20 *l.* an acre,  
comes to . . . . . 2,000

In the length of the canal there will be  
four miles required to be dug wholly  
within soil, this makes about 600,737  
cubic yards of digging, which, at 3*d.* per  
yard, is . . . . . 7,509

I propose the banks at an average eight  
feet above soil, 12 feet broad at top, and  
sloping towards the canal as five to three,  
which will give for a medium for thick-  
ness  $18\frac{1}{2}$  feet; both the banks added to-  
gether will be 68 miles long, which will  
contain 1,968,071 yards, which, at 3*d.* per  
yard, is 24,600 *l.* but of this sum, as before  
observed, one third should be deducted  
for what is already done by nature, con-  
sequently there will remain for the expense  
of banking . . . . . 16,400

To 50 locks at 1,000 *l.* each . . . . . 50,000

Two abutments on the banks at each  
lock, 100 in all . . . . . 10,000

For the dams at the ends of the bog of  
Dolater, as by Mr. Smeaton's estimate . . . 2,277

To extra expenses on the Allander pas-  
sage, by ditto estimate, . . . . . 13,754

To extra expenses in carrying the canal  
to Glasgow over the Kelvin river, by ditto  
estimate . . . . . 5,333

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Carried forward . . . . £113,273

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|                                                                                                                    |           |
|--------------------------------------------------------------------------------------------------------------------|-----------|
| Brought forward . . . .                                                                                            | £ 113,273 |
| For building 80 mills . . . . .                                                                                    | 5,000     |
| For conducting streams to the reservoir,<br>as by Mr. Smeaton's estimate . . . . .                                 | 500       |
| For 100 small bridges of one arch, 10<br>feet span each . . . . .                                                  | 3,000     |
| For advancing the canal from Dalmuir-<br>burn-foot to below Dunbuckford, as by<br>Mr. Smeaton's estimate . . . . . | 18,000    |
| For unforeseen accidents . . . . .                                                                                 | 20,000    |
| <hr/>                                                                                                              |           |
| Total . . . .                                                                                                      | £ 159,773 |
| <hr/>                                                                                                              |           |

I have already mentioned that were the canal to be 100 feet broad instead of 80 feet, the additional expense for the purchase of land, and the construction of locks which must have four piers instead of two, and for the labour of digging and banking, would not be considerable; for the same banks that would contain water in an 80 feet canal would do so in a canal 100 or 300 feet broad. The whole additional charge for a canal 100 feet wide instead of 80 would be only 41,420 *l*.

By pursuing the method of banking, I will venture to aver, that a canal 15 feet deep and 300 feet broad, excepting at the locks, might here be made from sea to sea for the expense of Mr. Smeaton's highest estimate, viz. 293,444 *l*. which he computes for a canal 69 feet broad and 12 feet deep, dug all under soil. Every reader may recollect what great quantities of water he has seen collected in gather-dams, or mill-ponds, by banks above their surface, and I appeal to any artist, who shall view this vale,

whether it is not very easy to form a string or chain of gather-dams from sea to sea, affording a depth and breadth of water sufficient for the navigation of vessels of 100 or 200 tons. Some canals in this island are justly matter of wonder, on account of the curious artifices used in their construction; but I could wish the whole wonder of this canal should be its simplicity, joined to an air of magnificence.

So far my author, whose merits or demerits I leave to the discerning reader to judge; to add an opinion of my own would be improper and superfluous; I shall proceed to give a short extract from the act granted to carry this canal into execution, according to Mr. Smeaton's plan and estimate.

This act was obtained in 1768, and is entitled An Act for making and maintaining a Navigable Canal from the Frith or River of Forth, at or near the mouth of the river Carron, in the County of Stirling, to the Frith or river of Clyde, at or near a place called Dalmuir-Burnfoot, in the county of Dumbarton; and also a collateral cut from the same to the city of Glasgow; and for making a navigable cut or canal of communication from the Port or Harbour of Borrowstonness, to join the said canal at or near the place where it falls into the Frith of Forth.

The proprietors are to raise the money among themselves to complete the work, but not to exceed 150,000 *l.* and to be divided into 100 *l.* shares; and 50,000 *l.* more may be raised if the first is insufficient: five shares qualify one vote, but no proprietor to have more than 10 votes let his subscription be what it may. In 1784 another act was obtained for extending, amending, and altering the

powers of the former act, which is so voluminous, that it is difficult to know how to extract the serviceable part only ; but this, perhaps, cannot be more properly done than taking a brief account from Mr. Knox's work, vol. 2, published in 1785.

Scotland is almost divided into two parts by the rivers Forth and Clyde ; the Forth falls into the east sea below Edinburgh, and communicates with the whole eastern coast of Great Britain, with France, Holland, Hamburgh, Prussia, Dantzic, Russia, Sweden, Denmark, Norway, and Greenland. The Clyde falls into the Atlantic Ocean, below Glasgow, and opens the trade with the west coast of Great Britain and Ireland, the south of France, Spain, Portugal, the Mediterranean, America, and the West Indies. These two rivers, falling in opposite directions into the two seas which encompass this island, and the neck of land between them being only 24 miles broad, first formed the idea of joining them, to open a communication across the kingdom, and make it useless to go the long dangerous navigation by the Land's-End of Cornwall, and the Pentland Frith.

This was first noticed in the reign of Charles II. as before mentioned ; that monarch proposed a passage for transports and small ships of war, at the expense of 500,000 *l.* but the sum was too much to be raised in his reign, and the design was laid aside. The beginning of the present reign the Earl of Chatham, endowed with all the penetration and magnanimity of an able statesman, proposed to carry the design into immediate execution, at the public expense, on a smaller scale than the first plan, but



sufficient to admit vessels of burthen ; unfortunately the resignation of that great man, among other causes, prevented the execution.

This scheme, now abandoned a second time by the state, was taken up by individuals. Nature had pointed out Borrowstonness\*, on the Forth, and Dalmuir-Burnfoot, six miles below Glasgow, on the Clyde, as the two extremities of this inland navigation ; but such was the force of influence, that instead of opening the east end of the canal at Borrowstonness, where there is water at neap tides for ships of 200 or 300 tons burthen, and safe lying ; it was begun upon the river Carron, at a mile distant from where it joins the Forth, and four miles above Borrowstonness, where vessels of burthen could not float at neap tides, besides the delay and inconvenience in navigating the Forth, and the mouth of the Carron river, from floods and contrary winds, and a circuit of two miles.

Mr. Smeaton, an able engineer from Yorkshire, had estimated the expense of four, seven, ten, and fourteen feet water. Certain merchants of Glasgow adopted the scale of four feet, which, although sufficient for the trade of that city, would have answered very little purpose to the nation in general, and it was suggested that the canal was never meant to join the Clyde. While a bill was obtaining for cutting the ditch of four feet water, and on the point of being passed, the east country gentlemen and

\* Borrowstonness is, next to Leith, the principal trading town on the Forth ; Dalmuir is a small village on the Clyde, washed by a rivulet called Dalmuir-Burn, to the junction of which with the Clyde the canal is to be carried.

traders took the alarm, objected to the partial utility of the plan, and, fortunately for the public, obtained a bill, extending the depth of water to seven feet. It was now necessary to open a subscription for 150,000 *l.* which was soon filled, and 130,000 *l.* was actually paid.

Mr. Smeaton began this difficult business in 1768, and had overcome great difficulties, and had cut nine miles, when, on account of a misunderstanding between himself and the managers of the canal, he resigned the business.

Two strangers from Yorkshire were immediately engaged to carry on the work ; when these men had completed nine or ten miles, they were discharged, and Mr. Smeaton called in again.

The work was now conducted upon the first principles till brought within sight of the Kelvin, and six miles from the proposed joining of the Clyde ; the subscription, and also a loan, being exhausted, the work was stopped in 1775. The inhabitants of Glasgow, by means of a collateral branch three miles long, opened a navigation from that city to the Forth, and thus the emporium of the north communicates with both sides of the island.

After several years experience, the navigation by the river Carron was found inconvenient, and a new subscription was proposed for opening a cut from Borrowstonness, to join the canal near Falkirk, and in 1784, a bill was granted by parliament for that purpose.

This work, when finished, will affect the Carron navigation, though every effort has been made to shorten that passage : some years ago a cut was made near the mouth of the river to shun a bed of

reach; and in 1784 the proprietor of the adjoining lands put himself to the expense of a second cut, by which the Carron river is now entirely avoided. It is one mile in length, and navigable for vessels of large burthen. Had this cut been made at first, there would have been no rivalry from Borrowstonness, but the whole business has been a series of blunders and unnecessary expense, in which the public-spirited proprietors are equally involved with those whose selfish views have been so very detrimental throughout. The money expended down to 1783, amounted to 212,000 *l.* No dividend has yet been made, nor can be made, until the debt be discharged, when it is supposed the expenditure will be 220,000 *l.* or 11,000 *l.* a year, while the tonnage, one year with another, does not exceed 7,000 *l.* About six miles, and those the most difficult, remained to be finished in 1784, for which Government have allowed 50,000 *l.* from the forfeited estates; if to this sum we add the expenditure at Borrowstonness, and the two cuts at the mouth of the Carron, this canal will cost 300,000 *l.* or more before the first dividend, while, at the same time, the tonnage is rated so high, that vessels carrying bulky goods often prefer the long passage by the Pentland Frith.

The dimensions of this canal, though greatly contracted from the original design, are much superior to any work of the same nature in South Britain. The English canals are generally from three to five feet deep, and from 20 to 30 feet wide, and the lock-gates from 10 to 12 feet, but they answer the purpose of inland carriage from one town to another, for which alone they were

designed. The depth of the canal between the Forth and the Clyde is seven feet, and 56 feet broad at the surface; the locks are 75 feet long, and the gates 20 feet wide. It is raised from the Carron by 20 locks in 10 miles, to the height of 155 feet above the sea-mark; at the 20th lock begins the canal of partition, on the summit between the east and west seas, and which continues on a level 18 miles, ending at Hamilton Hill, one mile north-west of the Clyde, at Glasgow. In some places the canal is carried over mossy ground, and in others through solid rock. In the fourth mile of the canal there are 10 locks, and a fine aqueduct bridge, which crosses the great road leading from Edinburgh to Glasgow: the expense of this mile was 18,000 £. At Kirkintulloch the canal is carried over the water of Logie on an aqueduct bridge, the arch of which is 90 feet, and was built at three different operations of 30 feet each, having only one centre of 30 feet broad, which was shifted on small rollers from one stretch to another. Though this was a new thing, and never attempted before with an arch of this size, yet the joinings are as fairly equal as any other part of the arch. The whole is acknowledged to be a capital piece of masonry; there are in the whole 18 draw-bridges, and 15 aqueduct bridges of considerable size, besides small ones and tunnels.

The supplying the canal with water was of itself a very great and difficult work. One reservoir is above 24 feet deep, and covers a surface of 50 acres, near Kilsyth. Another, about seven miles north of Glasgow, consists of 70 acres, and is banked up at the sluice 22 feet. The proprietors are now sensible of their error in not forming the

canal to have 10 feet water, and proposals have been made to raise the banks so as to get eight feet, but this, if practicable, would be very expensive; Mr. Smeaton, when asked the question, answered, that it would take great consideration to answer with safety; the probable expense would be 25,000 *l*.

Upon the whole, this canal, even in its contracted state, will exceed the most sanguine hopes of the public with respect to its general utility. The distance between the entry into the Clyde and the Forth, by the Pentland Frith, is 600 miles, but by the canal only 100. But this disproportion of distance in a sea voyage is trifling when compared with the delays, the shipwrecks, the positive and casual expenses attending a passage by the Hebrides and the Pentland Frith, or even by the Land's-End, particularly in time of war, when insurance is from 15*l*. to 20*l*. per cent. while by the inland navigation it is only 5*l*. per cent.

Mr. Smeaton having declined the business on account of his bad state of health, or some other motive, Mr. Robert Whitworth, a gentleman of approved abilities, was employed in finishing this canal, which was entirely completed on the 28th of July, 1790, when the public opening of the Forth and Clyde navigation from sea to sea was made by the sailing of a tract-barge belonging to the company of proprietors, from the basin of the canal near the city of Glasgow, to the river Clyde, at Bowling-bay. The voyage, which is about 12 miles, was performed in less than four hours, during which time the vessel passed through 19 locks, thereby descending 156 feet from the summit of the canal into the Clyde. It required only four minutes to pass

each lock, in which time the lock descended eight feet into the reach of the navigation below. In the course of the voyage from Bowling-bay, the tract-boat passed along that stupendous bridge, the great aqueduct over the Kelvin, 400 feet in length, and 70 feet high above the surface, a circumstance which gives this great work a pre-eminence over every thing of a similar kind in Europe, and does infinite honour and credit to the professional skill of that able engineer, Robert Whitworth, esq. under whose direction the remainder and most difficult part of this great undertaking has been completed in a truly masterly manner.

The committee of management, accompanied by the magistrates of the city of Glasgow, were the first voyagers on this new canal: on the arrival of the vessel in Bowling-bay, after descending from the last lock into the Clyde, the ceremony of the junction of the Forth and Clyde was performed by Archibald Spiers, esq. of Elderslie, chairman of the committee of management, who, with the assistance of the chief engineer, launched a hogshead of water of the river Forth into the river Clyde, as a symbol of joining the eastern and western seas together. This great event, so important to the trade and navigation of Great Britain, and particularly to the towns of Liverpool, Lancaster, Whitehaven, Greenock, Dublin, Newry, Drogheda, Belfast, Londonderry, &c. &c. on one side, and the towns of Lynn, Hull, Newcastle, Leith, Dundee, Aberdeen, &c. &c. on the other, as also to all the ports in St. George's Channel that trade to Norway, Sweden, and the Baltic, has opened a communication, which will not only shorten the distance from 800 to 1,000

miles, but also afford a more safe and easy passage, particularly in time of war, or at the end of the season when ships are detained long in the Baltic, and cannot attempt the circuitous sea voyage without great danger of spoiling their cargoes, or being too late for a market. The whole length of this canal is navigable from the Forth to the Clyde, 35 miles, of which 16 are upon the summit of the country, 156 feet above the level of the sea, to which height the vessel is raised by 20 locks from the eastern sea, and 19 from the western. Each lock is 20 feet wide and 74 feet long between the gates: the depth is exactly eight feet throughout, and the medium width 56 feet on the surface of the water, and 28 feet at bottom. The toll-dues payable on the navigation are 2*d.* per ton per mile, or 5*s.* 10*d.* per ton for the whole length of the canal, and the time required to pass from sea to sea, through the 39 locks, will be 16 hours.

The canal in its course from the Forth to the Clyde passes over 10 large aqueducts or water-bridges, and 33 small aqueducts and tunnels, being 43 in all.

There are also 33 draw-bridges over the canal.

From Grangemouth to Glasgow the tonnage is 4*s.* 10*d.* and from Bowling-bay to Glasgow 2*s.*

Miles.

The rise of the canal from lock No. 1, at Grangemouth, to lock No. 20, at the summit of the navigation, is 156 feet, and it extends in length... 10½

The summit of the canal or head level from

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Carried forward . . . . 10½

|                                                                                                                                                      |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
|                                                                                                                                                      | Miles.           |
| Brought forward. . . . .                                                                                                                             | 10 $\frac{1}{4}$ |
| lock No. 20, east to the point of partition at<br>lock No. 21, is in length. . . . .                                                                 | 16               |
| The fall of the canal from lock No. 21, at<br>the end of the summit of the navigation, to lock<br>No. 39, in Bowling-bay, is 156 feet, and in length | 8 $\frac{1}{2}$  |

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The extreme length of the navigation from  
Forth to Clyde is. . . . . 35

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The extreme length of the collateral to Glasgow 2 $\frac{3}{4}$

|                                               |       |
|-----------------------------------------------|-------|
|                                               | Feet. |
| The medium width of the surface of the canal  | 56    |
| Ditto of the bottom of the canal . . . . .    | 27    |
| Depth of canal from sea to sea . . . . .      | 8     |
| The fall of each of the 39 locks on the canal | 8     |
| The width of each lock . . . . .              | 20    |
| The length of each lock, between gates. . . . | 74    |

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The canal in its course from the Forth to the Clyde  
passes over 10 large aqueducts or water bridges, and  
33 small ones and tunnels.

#### CRINIAN CANAL.

An act was obtained 33 Geo. III. for making a  
canal from Loch Crinian to Loch Gilp, in the  
county of Argyle in Scotland, being a short cut of  
seven, or at most nine miles, and is particularly in-  
tended to accommodate the trade of the Western  
Islands and fisheries, as by it they will avoid a very  
hazardous and circuitous voyage and dangerous sea  
round the peninsula of Cantyre, and may at all sea-  
sons of the year arrive in safety and dispatch in the



Forth of Clyde and that neighbourhood, where is chiefly their market. It was not then determined which of the two routes to prefer, being so nearly alike. The distance by the nearest line is 7 miles, with a fall of 62 feet and a rise of 61 feet, and this is named the Dell-passage. The other is called the passage of Auchinshallach, which goes through the Moss of Crinian, which is nine miles and a half long; the rise is 58 feet, and the fall 59 feet. It is intended to make the canal from 12 to 15 feet deep, so that large vessels of burthen may conveniently pass and repass, and the breadth is allowed to be 160 yards. The company have the usual powers, and are empowered to raise 120,000*l.* to be divided into 50*l.* shares, and no person to have above 10 votes; and they may raise 30,000*l.* more if wanted. By this useful cut a voyage may be completed in three or four days at all seasons, that used frequently to take up three weeks, and the voyage from Glasgow to the Hebrides will be almost entirely inland. Government will also be greatly benefited by this cut, as troops and military stores and baggage may be conveyed with expedition and security, between the Highlands and the Clyde, where the troops generally take shipping for the place of destination.

Another most useful inland navigation is in contemplation, and intended to be cut between Fort William and Inverness, and is 59 miles in length, but the natural advantages of lochs in the whole tract is so great and useful that not above 2 miles of real land without any river is wanted to be cut. The route and expense, together with the local and national advantages that will accrue from this canal, are wonderful, and well and ably set forth by Mr. Knox and

Dr. Anderson, to whom I beg leave to refer for particulars, as they are too long to insert here, as well as out of the intention of this publication.

ABERDEENSHIRE CANAL. 1796.

The preamble states, that the making and maintaining a canal navigable for vessels from the harbour of Aberdeen through that parish and the parishes of Old Machar, Newhills, Dyce, Kinnellar and Kintore, on the south side of the river Don, and into the said river at or near the bridge over the same adjacent to Inverury, all within Aberdeenshire, will greatly facilitate and render more convenient and less expensive the conveyance of all kinds of commodities, and will be of great public utility: it is enacted, that (now follow the names of the company of proprietors) and their successors, and also such person as may have a share therein, shall be united into a company for making and maintaining a canal, and shall be one body politic, by the name of the Company of Proprietors of the Aberdeenshire Canal Navigation, which they shall keep navigable for vessels from the harbour of Aberdeen through Old Machar, Newhills, Dyce, Kinnellar, and Kintore, into the river Don, and may supply the canal with water from all such springs as may be found in making the same; and from the river Don, and from all streams and water-courses which shall be found within 2000 yards of any part of the canal, and may cleanse or straighten any such streams or water-courses, and may lay down feeders, pipes, and make aqueducts, weirs, engines, bridges, tunnels, locks, sluices, drains, wharfs, quays, toll-houses, warehouses, watch-houses,

weighing beams, cranes, docks, fire engines, landing places, and other machines and conveniences where they shall think requisite.

A plan and book of reference are deposited with the clerk of the peace for the county; and not to deviate therefrom without the consent of the landowners. The canal, side drain, towing-path, and fences are not to exceed 20 yards in breadth, except in such places where any dock or basin shall be made, or where the canal shall rise higher or be cut deeper than 5 feet from the present surface, or where vessels shall lie or pass each other, or where any wharf, warehouse, crane, or weighing beam *shall* be erected, nor more than 100 yards in breadth at any place, except at the head of the canal in the parish of Kintore, where the company shall make a wharf not exceeding 4 acres in extent.

The company may raise among themselves any sum not exceeding 20,000*l.* and no person shall become proprietor of less than one share, or shall have more than 40 shares, which shall be 50*l.* each, and be deemed personal estate; and in case the above sum is insufficient, they may raise 10,000*l.* more among themselves or by admission of new subscribers, or on mortgage; and no proprietor, although he may hold more than 20 shares, shall have more than 20 votes in his own right, or 20 votes by proxy. Marks or stones are to be set up on the sides of the canal at every half mile. Boats for pleasure only are allowed, but not above 12 feet long and 4 broad, and not to go through any lock, and the owners to make a place in their own land for the boat to lie out of the way of the canal. This shall be deemed a public act.

N. B. The usual clauses are inserted as in all navigation acts, besides a vast number to secure private property, especially mills and fisheries, and a long explanation of rates and tonnage.

CRINIAN CANAL, TO AMEND. 1799.

The preamble states, that an act passed 33 Geo. III. cap. 104, whereby John Duke of Argyle, and several other persons therein named, were incorporated by the name of the Company of Proprietors of the Crinian Canal, for the purpose of making and completing the said canal and other necessary works; and the company have made great progress in carrying on the said works; but the same cannot be completed by reason that several of the subscribers in England and Scotland, many of whom are merchants and manufacturers, have not been able to answer the calls made on their respective subscriptions, whereby it is become necessary to raise a farther sum of money, on other terms than the company are now empowered to do; and the said act requires also to be further explained, enlarged, altered, and amended: In order, therefore, to prevent delay in carrying on and completing the said works, which would be attended with injury to the company and the public; be it enacted, That it shall be lawful for the company of proprietors of the Crinian canal to borrow a further sum not exceeding 30,000*l*. (although the whole of the 120,000*l*. allowed to be raised by the recited act may not have been raised), and to take up the same at legal or less interest, from such persons as shall be willing to lend the same; and the said sum of 30,000*l*. the company are authorised to raise by mortgage, annuity, bonds, notes, or new admission

shares, &c. And this shall be taken and deemed a public act.

N. B. This is certainly one of the most useful acts for the fisheries of Scotland that ever were passed. Even the Forth and Clyde canal is not more useful. Had I time or room to enlarge on this subject I should most willingly ; and I hope to see it followed up by a canal navigation from Fort William to Fort George, and several other canal navigations in Scotland are much wanted.

ABERDEENSHIRE CANAL, TO FINISH. 1801.

The preamble states, that by an act passed 36 Geo. III. divers persons therein named, were incorporated under the name of The Company of Proprietors of the Aberdeenshire Canal Navigation, and were authorised to make and complete the said canal as therein directed, and for that purpose to raise and contribute among themselves the sum of 20,000*l.* and if that should be insufficient they were authorised to raise by mortgage, or by admission of new subscribers, 10,000*l.* more. And whereas only 17,800*l.* of the said sum of 20,000*l.* has been subscribed, and the company have cut a considerable part of the canal, whereby they have expended the whole of the money so subscribed, excepting arrears and insolvencies, besides incurring several debts ; and have also endeavoured to procure the farther sums of money authorised by the said act, but without effect ; and it would tend to the more speedy completion of the canal, if the said company were empowered to raise an additional sum, by creating new additional shares : Therefore be it enacted, that the said company of proprietors are authorised to raise the sum of

20,000*l.* or so much thereof as shall be necessary for completing the said navigation, over and above the money authorised to be raised by the said recited act; and that the new shares shall be 20*l.* a share, and shall receive an annual dividend of 20*s.* per share, should the tolls of the canal produce so much, before the proprietors of the original shares be entitled to any shares or dividend. But that whenever the dividend shall amount to 20*s.* per share, on the new shares, the remainder shall be divided among the proprietors of the original shares, until they receive an annual interest or dividend of 50*s.* per share. And it is also hereby declared that three new shares shall entitle the holder to one vote, and five shares to two votes, and so on in proportion, and that eight such shares shall be a qualification to be chosen of the committee of management; but that no person shall be entitled to more than 20 votes in his own right, and 20 votes by proxy, whatever number he may happen to hold in the new additional canal stock. And it is further enacted, that the subscriptions for the new shares, to be created by virtue of this act, shall not be binding on the subscribers, unless the sum, at least, of 15,000*l.* is subscribed, or otherwise obtained, for the purposes of completing the said canal navigation. And this shall be taken and deemed a public act.

N. B. This short act, and recital of another act, has only nine clauses, which contain every thing necessary for information and satisfaction. Here are no surveys and re-surveys, nor a London solicitor's tautology, but the essence and quintessence of justice and economy, and not like one I am just going to abstract and insert, consisting of 127 clauses;

but it must be considered that it is the production of London.

GLENKENNS CANAL NAVIGATION. 1802.

The preamble states, that certain persons and their successors therein named shall, for the following purpose, be one body politic and corporate, by the name of The Company of Proprietors of the Glenkenns Canal Navigation, and are authorised to make and complete a canal navigable for boats, barges, and other vessels from the Boat Pool of Dalry, along the east side of the rivers Kenn and Dee, in the Glenkenns, through part of the said parish, and through the parishes of Balmaclellan, Parton, Crossmichael, Kelton, and Kirkcudbright, to a place called Upper Carse, and from thence to the tideway of the river Dee at the town of Kirkcudbright, and to supply the canal with water from the river Dee and Kenn, and from all such lochs, brooks, springs, streams, rivulets, and water-courses as shall be found in digging the said canal, or within the distance of 2000 yards thereof, (excepting the streams within the lands of Low Arkland, Billes, Miltherd, Netherthird, Culdoach, Upper Boreland, and Burnside, as are used or may be used in irrigating the lands on the lower side of the canal) or from any reservoir to be made, as hereafter mentioned, for supplying the said canal with water; and the said company may erect a dam or weir across the river Dee, at or near Glenlochal bridge, and also any other dams or weirs in the said river above the bridge, as may be found necessary, so as not to obstruct the fishery at the mouth of the river Dee. And the said company, in constructing the said canal, may dig and carry away all kinds of

earths, stone, or trees that may be in its progress, and make such weirs, reservoirs, feeders, trenches, passages, aqueducts, and water-courses, as may be necessary to supply the said canal, and may also erect and build bridges, piers, arches, tunnels, sluices, locks, weirs, pens for water, drains, wharfs, quays, cranes, landing places, weight beams, fire engines, rail-ways, roads, ways, and other works, and repair, support, vary, and alter the same when the said company shall think requisite; and they are also authorised to make rollers, inclined planes, rail-roads, or by any other manner than by water, if they think proper so to do; and the land to be taken for the said canal, inclined planes, rail-roads, towing-paths, ditches, drains, and fences shall not exceed 26 yards in breadth, except where the canal shall be raised higher or cut above 5 feet deeper than the present surface of the land, and not above 60 yards in any place, except where the canal shall pass over any common or waste lands. A plan of the line of the canal and book of reference are deposited, one with the clerk of Kirkcudbright, and another with the clerk of the company, and not to be deviated from without consent of the parties.

And be it further enacted, that the said company are authorised to raise among themselves 30,000*l.* for making and completing the said canal and other works and conveniences as before mentioned, and for no other use or purpose whatsoever, and to be divided into 300 shares of 100*l.* each, which shall be deemed personal estate; but if 20,000*l.* will complete the said works, then only to be divided into 200 shares of 100*l.* each; but if the first sum of 30,000*l.* should be found insufficient, the company may bor-



row and take up at interest 15,000*l.* more, by way of mortgage or otherwise. And the said canal is not to be begun till 20,000*l.* is subscribed for; and if not subscribed for within 5 years after the passing of the act, all the powers and privileges to cease.

The subscribers to have votes personally or by proxy, as in other canal navigations, for not less than one nor above 20 shares; and collateral cuts may be made into the canal from the different mines of coal, iron-stone, lime-stone, and other minerals or fossils, or of furnaces and other works. And this shall be taken and deemed a public act.

N. B. Scotland has long wanted the assistance of inland navigation by canals. The national utility of the Forth and Clyde canal will, it is to be hoped, spur up the nobility and gentry of that country to exert themselves, and draw from the bowels of the earth its hidden treasures.

#### CANAL FROM FORT WILLIAM TO THE MUREAY FRITH.

I am happy to hear that a navigable canal across the Highlands of Scotland, from the west to the east sea, has just received the sanction of parliament, (June, 1803). This grand but most useful undertaking, comprising a distance of 59 miles, above two-thirds of which are already performed by nature, has been many years in contemplation; its utility is incalculable, and far beyond any thing of the kind in Great Britain, or even Europe.

Owing to the poverty of the country and the deficiency of mines, at least hitherto discovered, there were not sufficient inducements for the manufacturers to commence so great an undertaking; it has therefore received the assistance of government; and

when the advantages, which the nation at large will derive from this canal, are considered, it will excite no little astonishment that it has not been accomplished before.

This canal will not only insure, without risk of uncertainty, the passage of the whole Baltic and North Sea trade to the Irish channel in seven days during the summer months; which by the present dangerous navigation round by the Shetland and Orkney islands cannot be effected in stormy weather in less than three months; and this with most imminent risk and frequently immense loss, not only of valuable ships and cargoes, but of the invaluable lives of British seamen; but it will also enable this country to carry on with little or no risk, and with extraordinary celerity, a commerce which now amounts to four millions annually, as well as secure the most important expeditions to our naval operations, by opening from east to west a ready, safe, and rapid channel for our naval squadrons.

Undoubtedly in digging this canal veins of minerals will be found that will incite artists and manufacturers to flock to a place where land can be had at a cheap rate, and will induce the land owners to give pecuniary assistance where wanted to forward undertakings, by which the riches of the bowels of the mountains may produce ten or twenty-fold returns, eight or ten times a year. The mountains in Wales continued unexplored, barren, and useless for ages, but are now found to contain lead, iron, copper, coals, marble, &c. &c. in the greatest plenty, and some hundreds of people are employed, and whole villages built to accommodate them on a spot which a very few years ago was an uninhabited waste. The

mountains of Scotland are, most probably, in the same state; and as the nobility, gentry, and land-owners in Wales have set the example to assist the artist and manufacturer to turn the contents to advantage, so doubtless the nobility and gentry of Scotland will have the good of their country as much at heart, and by exploring the barren mountains contiguous to this canal will profit by the example of Wales, and encourage artists and manufacturers to come among them (the writer of this abridgement, who has a thorough knowledge of building, surveying, and mineralogy, would like to make one of the number), to teach and employ the poor inhabitants already there, and entice other workmen, which will encourage future population and lead to riches, and in time make up the deficiency of the great emigrations that have, within the last half century, depopulated the largest half of the Highlands of Scotland, for want of employ and a little assistance.

One thought crowds on another, and brief as I wished to be, so numerous are the openings to trade by this canal, unknown to the generality of my readers, that it would be imprudent, as well as unpardonable to leave off thus abruptly.

A celebrated author of the first consequence and undoubted veracity mentions that Easdale and the neighbouring islands produce very fine slate. The island of Islay a very rich lead ore, which has yielded 1700 pound weight of refined lead for each ton of ore, and 42 ounces of silver, as also copper, iron-ore, sulphur, and emery. In Tiree is fine marble equal to the richest Italian, and the finest of statuary in the Isle of Skye, as also pure crystalline sand for

making fine glass. Coals in the Isle of Bute and Isle of Mull, as well as at Loch Alin and Loch Sunart, in the districts called Morven and Ardnamurchan. Manganese, in Ross-shire canal; coal, lime-stone, marl, &c. &c. &c. In fact it would be tiresome to enumerate what has already in the mineral kingdom been found, with the greatest probability and symptoms of many others, near the whole length, and on both sides of this most useful inland navigation.

But the present riches of Scotland consist in its herring and salmon fisheries, especially the former, which is not so well known and so well attended to as it ought to be; I do not mean to enter into any particulars on that great staple of Scotland, as that has already been done by able hands, I merely mention it, as the canal will greatly facilitate those fisheries.

To begin now with the canal, I shall describe it from Fort William, at the head of Loch Linnhe, to Inverness and Fort George, in the Murray Frith, which is 59 miles, and is a straight valley bounded by hills from sea to sea. Loch Linnhe, from the Isle of Mull, at its mouth, to Fort William, cannot be less than 45 miles long, and navigable all the way for ships of the line. From Fort William to Loch Lochy is already a small river, which must be widened and deepened,  $7\frac{1}{2}$  miles long; then in a direct line lies Loch Lochy, which is  $10\frac{1}{2}$  miles long, and is 80 feet above the high water at Fort William, and about a mile wide, and every where deep enough for the largest ships, except just at its entrance into the river or strait that goes out of it to Fort William. Then comes the only real piece of ground

to be entirely cut through, and this is variously stated, by some at two miles, others at  $2\frac{1}{2}$ , and again at three miles ; however, be it as it may, the distance is small, as is the summit of the land to be cut, which is 20 feet higher than the last, or 100 feet higher than the high water before mentioned, to go in a direct line to Loch Oich, which is four miles in length, and from a quarter of a mile to half a mile in width, with depth sufficient for any ship ; this is the point of partition, and from hence the water discharges itself into Loch Ness, by a small river or narrow strait, still in a direct line, five miles long, in which it descends 55 feet, and at the end of this river or strait stands Fort Augustus, on a piece of ground jutting into Loch Ness : the valley continues the same all through, and at this place is about half a mile wide. Now we come into Loch Ness, which is computed to be 22 or 24 miles long, lying in a direct line ; it is from one to two miles broad throughout, and in most places 140 fathoms deep without rocks or islands, the water remarkably clear and pleasant, and well stocked with salmon, trout, and pike, and never freezes ; a sloop of 60 tons burthen is continually sailing on this lake to supply Fort Augustus from Inverness. This Loch is 45 feet above the level of high water in the Murray Frith, and from this Loch runs a river to Inverness, which is eight miles in length, and still in a direct line to the Murray Frith, and is called the River Ness ; the valley is about a mile wide, and this must be widened and deepened. To recapitulate the aforesaid particulars, I shall put them in one point of view :

|                                          | Miles.           | Feet rise. |
|------------------------------------------|------------------|------------|
| The canal upon the river Ness, length .. | 8                | 45         |
| Canal upon the river Oich .....          | 5                | 55         |
|                                          |                  | <hr/>      |
| Greatest rise .....                      |                  | 100        |
|                                          |                  | <hr/>      |
|                                          |                  | Feet fall. |
| Canal on the summit, descending ..       | 2                | 20         |
| Canal on the river Lochy .....           | 7 $\frac{1}{4}$  | 80         |
|                                          |                  | <hr/>      |
| Total length to cut and deepen ..        | 22 $\frac{1}{4}$ | 100        |
|                                          |                  | <hr/>      |

## Lengths of the navigable Lochs :

|                  | Lengths.         | Rise above high water |
|------------------|------------------|-----------------------|
| Loch Ness .....  | 22               | 45                    |
| Loch Oich .....  | 4                | 100                   |
| Loch Lochy ..... | 10 $\frac{1}{4}$ | 80                    |
|                  |                  | <hr/>                 |

Total length navigable fresh-water Lochs .. 36 $\frac{1}{4}$ Length of canal to be cut ..... 22 $\frac{1}{4}$ |

Total distance between salt water on both

sides ..... 59 |

From sea to sea, on each side of the island, the whole is a direct line, south-west and north-east; nature seems to have been uncommonly favourable to this inland navigation: the whole distance from sea to sea is only 59 miles, and if the Linnhe Loch be considered, as it must be, a part of the Channel, and that part of the Murray Frith above Ardresier point, it will then be at least 100 miles, of which the whole is at present navigable water for ships of

any burthen, except 22½ miles of land, and 20½ miles of that are small rivers, that want only to be widened and deepened, and actually only two miles of real dry land to cut through; with respect to a supply of water also for this great navigation, the natural reservoirs would or will supply a much greater quantity than ever will be wanted, without the expense of one shilling, for excepting the three Lochs which the canal passes through, and which alone are sufficient; those are the Lochs Arkeig, Garry Quoich, Eil and Laggan, that empty themselves by small rivers into the three first mentioned Lochs.

An estimate was made, and also a survey, about the year 1780 or 1783, and it was reported that the land to be purchased would be 453,314 acres, and the expense of cutting the canal 12 feet deep 164,031 l.

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## IRELAND.

### CANAL FROM THE CITY OF DUBLIN TO THE RIVER SHANNON.

*Extracted from Arthur Young's Tour through Ireland.*

THIS grand canal, from the city of Dublin to the river Shannon, was originally planned by Mr. Omes, the engineer to the Lagan navigation, and carried on under his direction from Dublin into the bog of Allen, at the expense of 77,000l. When the work was advanced thus far, it was discovered that several capital mistakes had been committed in the levels, the water in some places of the canal being 4 or 5 feet

deeper than in others ; in consequence of which, the work being almost at a stand, in the year 1770, the members of the right hon. and hon. navigation boards called in Mr. Vallency, who subscribes himself " Director of Engineers," to survey the works, and advise what was proper to be done ; but the Lord Mayor and corporation of Dublin, who had the success of this work much at heart, not being satisfied with Mr. Vallency's survey and report, called in Mr. John Traité, engineer, who differed very widely from Mr. Vallency in almost every part of his survey and report, and has in general assigned very good reasons for so doing. Since that time some other engineers have been consulted ; yet, after all the sums of money have been expended, this canal is far from being completed.

The failure of this great work, which at first might have been so very easily completed at a moderate expense, may justly be attributed to the want of a well digested plan and survey, for it does not appear that there were many material difficulties in the whole line but what might have been overcome with great ease, had the work been properly conducted by an able engineer ; since neither money nor a proper attention to its being laid out judiciously was wanting, as may be seen by the resolves of the company of proprietors, to shew how careful they were to properly supply in time, and prevent the work from standing still for materials or utensils. Now follow 44 resolves and orders of the company of proprietors in 1771, many of which are very long, and to the reader useless and uninteresting, unless the work had been executed, and even then would exceed the limits of this abstract ; to those to



whom it may be interesting the book before mentioned will explain.

The course of this canal is from the city of Dublin over the rivers Little Mouell and the great Mouell, and then across the river Liffy, by Döwingo, and the Isle of Allen, into the Bog of Allen, and into the river Maiden, at Tullimore, which goes into the river Brusna, and falls into the Shannon near Moy's Town. A canal is cut out of the grand canal, in the middle of the Bog of Allen, into the river Boyne at Edenderry, and another near Clonbullock into the river Barrow, to Monesteraven, and into another branch of the same river at Portarlinton; another cut is also made to Naastown, and a fourth to Johnstown. Several more cuts equally useful are in contemplation, the navigation being far from complete.

The whole length from Dublin to the Shannon is  $61\frac{1}{2}$  miles.

I have before observed that the expense of carrying the canal through the bog of Allen, to the year 1770, when a stop was put to it, till further and more accurate surveys should be taken, was 77,000*l*. New surveys have been made since, and other engineers appointed; but notwithstanding the vast sums of money laid out, or rather squandered away upon it, to the amount of upwards of 300,000*l*. it still remains unfinished; and a very intelligent gentleman, who travelled through Ireland from motives of pleasure and curiosity, assured me, in August, 1790, upon his arrival in England, that he had the most authentic information that this grand canal, with all its faults and blunders, has already cost above 500,000*l*. yet was far from being completed, and is in fact merely a job.

My author on the present state of Ireland; down to 1780, observes that he has made inquiries, and travelled many miles to view some of the navigations; and the only one which appeared to him to be completed, is the canal from the town of Newry, to the sea, on which he saw a brig of 80 to 100 tons burthen. The same canal is extended farther than that town, but stops short of the great object for which it was begun and made, viz. the Drumglass and Dungannon collieries; this may therefore be classed as incomplete, relative to the object; but as Newry is a place of considerable trade, finishing it so far has some merit. The great and principal design was to supply Dublin with Irish coals, which was probably feasible; for the seams of coals in those collieries are asserted to be of such a thickness and goodness, as prove them more than equal to the consumption of half a dozen such cities as Dublin. But two great difficulties were to be overcome; first, to make the navigation such that all land carriage might be saved, which was properly a public work; and secondly, to work the collieries, which was properly private business; but from the utter deficiency of capital in the individuals concerned, could never be done without public assistance. To get over these difficulties, parliament went very eagerly into this business. They granted so liberally to the canal, that it is finished to within two or three miles of the collieries. At the same time a private company was formed for working the mines, to whom considerable grants were made to enable them to proceed. The property in the works changed hands several times; among others, the late Archbishop of Tuam (Ryder) was deeply con-

cerned in them, and entered with great spirit into the design; but what with the impositions of people employed, the loss of some who were able and honest, the ignorance of others, and the jobbing spirit of some of the proprietors, parliament, after granting enormous sums both to the canal and collieries, had the mortification, instead of seeing coals come to Dublin, to see nothing but gold sent from Dublin, to do that which fate seemed determined should never be done, and so in despair abandoned the design to the navigation board, to see if their lesser exertions would effect what the mightier ones had failed in. A Mr. Ducate, an Italian *engineer*, and very ingenious architect, has had for a few years the superintendence of the works, but the temper of the nation has been so soured by disappointments, that he has not the support which he thinks necessary to do any thing effectual. The importance of the object will appear from this circumstance; that upon seven years average, from 1764 to 1770, the import of coals amounted to 180,113 tons per annum, and in the next seven years, from 1771 to 1777, to 204,566 tons. From whence it appears that not only the quantity itself is great, but that it is also a very rising import, owing to the increase of Dublin, which has enlarged with the increasing prosperity of the kingdom.

The little effect of all attempts to supply Dublin with Irish coals, is seen by the bounties paid for that purpose, amounting to no more for the last seven years than from 100*l.* to 200*l.* a year. In the years 1776 and 1777 they were so little as 86*l.*

All inland navigations have something to carry before they seek for means of carriage; but I will

venture to say that if this grand canal was entirely completed, the navigation of it, including whatever the country towns took from Dublin, would prove of such little account, that it would remain a greater monument of folly, if possible, than at present. Some gentlemen I have discoursed with on this subject have replied—"It's a job; it was meant as a job; you are not to consider it as a canal of trade, but as a canal for public money." But even this, though advanced in Ireland, is not upon principle. I answer that something has been done; 14 miles are cut, and numbers of locks, quays, bridges, &c. &c. are absolutely finished, though only for the benefit of eels and skating. Half what these 14 miles have cost would have finished the Newry canal, and perfected the Dungannon collieries. Might not the same persons have plundered the public to the same amount in executing some work of real utility, from which something else might have resulted than disgrace and ignominy to the nation?

As to the other navigations in the kingdom, there is in general this objection to be made to them all, however necessary they might be, they are useless for want of being completed; three-fourths are only begun, the gentlemen of the neighbourhood of them have had interest enough in the navigation board to get a part only voted, and from a variety of undertakings going on at the same time, all are for the same reason incomplete. The advantage to the public has been more trifling from all than from a single one finished.

The coal mines nearest the grand canal are at Castlecomer, the estate of Lord Wandesford, who

is said to clear 10,000*l.* yearly by them. If the grand canal were finished to the river Barrow, he would probably make as much more, for that would open a communication with Dublin; but hills interpose, which must be cut through for that purpose. The carriers at present pay 5*d.* per cwt. and sell them at Dublin for 1*s.* 8*d.* per cwt. after carrying them 80 English miles.

The good effect of a short canal, cut near the town of Limerick, is very sensibly felt; for sea coal, which was formerly the fuel of the inhabitants, is so disused, that its price is much lowered; turf, the material, and I may say the manufacture of which is all their own, now supplies their hearths. If the merchants of Limerick would cut canals opposite to the shallows in the river Shannon, it would be rendered navigable to Carrick, in the county of Leitrim, being a space of 90 miles, which would open a conveyance for grain, timber, iron, coals, turf, &c. and must at length turn the current of trade in their favour.

A navigation of near 200 English miles in length, by communicating with the canal leading from Dublin through the bog of Allen, might be accomplished at a trivial expense, considering its real utility; such a navigation would in time make Limerick one of the most considerable places for importation in the kingdom. The large tracts of country on both sides the river, cannot fail of creating a great demand. The same cause may operate on the exports, by facilitating the conveyance of beef, mutton, butter, hides, tallow, grain, &c. &c. to a sea-port. Though the town is 60 miles

from the sea; ships of 500 tons come up to the quays. . . . .

Ireland is at least 800 miles in circumference, and contains nearly 2,000 square miles, and what is worthy of observation is, that the inland parts are not, one place with another, above 24 miles from the sea; what a noble field for canals and improvements! I will venture to aver, that the money already granted and expended, if properly laid out, would have intersected the country with canals, and an inland navigation might have been established throughout the internal part of the whole country, (three or four counties only excepted) to the great advantage of the land-owners, and manufactures that are already established, the probable settlement of many new ones, and the encouragement and improvement of agriculture through every part of the kingdom.

A canal has been marked out from Belfast to Loch Neagh, and an act obtained for carrying it into execution: the plan and particulars I had of its route, rises and falls, but lending it to a gentleman, who lent it to a noble Earl, part of whose lands it goes through, to see how the quarries of marble were marked down on his estate, I could never get it returned, nor could I by any means get another, so that I cannot give any description of it.

I shall conclude with stating from the journals the sums granted by the Irish Parliament for completing these canals, and working the collieries, (which will shew that the fault did not lie in the employers, but in the employed) from 1753 to 1770 inclusive.

|                                         |         |
|-----------------------------------------|---------|
| Newry river navigation .....            | £9,000  |
| Dungarvon aqueduct.....                 | 1,300   |
| Shannon navigation .....                | 31,500  |
| Grand canal .....                       | 73,646  |
| Barrow river .....                      | 10,500  |
| Minsterkenry collieries. ....           | 2,000   |
| Drumglass colliery and navigation ..... | 112,218 |
| Dromreagh ditto .....                   | 3,000   |
| Lagan ditto .....                       | 40,304  |
| Blackwater ditto .....                  | 11,000  |
| Lee river navigation .....              | 2,000   |

Several other rivers have likewise been deepened and cut to improve the inland navigation of the country. The above sums, however, with other monies granted by the navigation board, ought to have completed the works entirely.

The following sums were granted by the navigation board only, from 1768 to 1771.

|                       |        |
|-----------------------|--------|
| Newry canal .....     | £2,434 |
| Barrow ditto .....    | 3,100  |
| Grand ditto .....     | 4,585  |
| Fergus ditto .....    | 85     |
| Drumglass ditto ..... | 5,566  |
| Shannon ditto .....   | 7,660  |
| Boyne ditto .....     | 9,507  |

The total of the money paid out of the revenues for inland navigations, collieries, docks, &c. amounts to the enormous sum of 379,388 l.

It is not to be wondered at, that, in 1771, after the grand canal had been so long in hand, and after

such great sums had been expended on it, though so little was completed, and every thing nearly at a stand, the management of it should be taken from persons so unfit for such a work, and committed to others. This alteration, however, has not succeeded to the wishes of the nation, or promoted the wishes and expectations of the employers.—So far Arthur Young.

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### NORTH AMERICA.

THE United States of America, now in their infancy as a nation, cannot be expected as yet to afford many examples of improvement by canals. That country, if I may be allowed the metaphor, resembles a young man just out of his apprenticeship, and set up in business for himself, whose whole time, care, abilities, and exertions, must be employed to maintain his credit and situation, without his being able for some time to afford to lay by any thing for improvements. In like manner America, but lately disengaged from her dependency on the mother country, and after an expensive war for her freedom, which has deranged, and for a time ruined her finances, cannot be supposed capable of improving the advantages which nature has so lavishly bestowed on her. She possesses an immense sea coast, the whole length of which is happily situated for trade, and abounds with excellent bays and harbours, while the internal parts of the country are intersected with the noblest rivers, many of which are navigable for ships of the largest burthens, for some hundred miles within land, and even to the very



doors of the planters, so that little art or improvement by canals is wanting to render that country the most convenient for commerce and inland navigation of any in the world.

But although America is only yet in her infancy in point of independence as a nation, she has experienced the happy effects of improving trade, by the encouragement and bounty of a benevolent parent. Her noble coasts, bays, rivers, and products, have invited, for half a century, the maritime countries of Europe to engage in her trade; and the West India Islands belonging to the European States have by her been principally supplied with the necessities of life, and enabled to send home their produce. The profits of her trade, which used formerly to be drawn to the mother country, now centre in her states; and it may with great truth be said, that no part of the world is so well watered with springs, rivulets, rivers, and lakes, as the territories of the American States. By means of the various streams and bodies of water, the whole country is divided into islands and peninsulas. The United States, and indeed all parts of North America, seem to be formed by nature for the most intimate union.

The United States of America contain 640,000,000 of square miles, including 22,000,000 of square miles in lakes and rivers.

The facility of navigation renders the communication between the ports of Georgia and New Hampshire infinitely more expeditious and practicable than between those of Provence and Picardy, in France, Cornwall and Caithness, in Great Britain, or Galicia and Catalonia, in Spain. The canals pro-

posed at South Key, Susquehannah, and Delaware, will open a communication from the Carolinas to the western counties of Pennsylvania and New York. The improvements of the Potomak will give a passage from the southern states to the western parts of Virginia, Maryland, Pennsylvania, and even to the lakes: from Detroit on Lake Erie, to Alexandria, on the Potomak, being 607 miles, there are but two carrying places, which, together, are not above 40 miles. The canals now cutting to the Delaware and the Chesapeak will open a communication from South Carolina to New Jersey, Delaware, the principal parts of Pennsylvania, and the midland counties of New York. These important works have been surveyed, and it is computed they may be completed for 200,000 guineas. The United States of America will hereafter be converted into a number of large fertile islands, uniting and trading with each other with ease and small expense, and in many instances without the danger of the sea, or uncertainty of adverse winds.

On the north side of the mountains in Orange country, in the state of New York, lies a very valuable tract called the drowned lands, which contains 50,000 acres. The waters that descend from the surrounding hills, being but slowly discharged by the river issuing from them, cover these vast meadows every winter, and render them extremely fertile, but they expose the inhabitants to intermittents. The Wallkill river, which passes through this watery tract, and empties itself into Hudson's river, is in the spring stored with large eels, in the greatest plenty; the bottom of this river is broken rock, and from an accurate survey it is supposed

2,000 *l.* would be fully sufficient to deepen the channel so as to let off all the waters from the meadows, and thereby redeem this rich tract of land for grass, hemp, and Indian corn. In 1789 it was in contemplation to raise this sum of money, and complete this undertaking.

In Pennsylvania, the river Swetara, which falls into the Susquehannah, from the north-east, is navigable 15 miles; it is now intended to cut a canal 20 miles, from the river Swetara to the river Talpehoken, a branch of the Schulykill; should this be effected, a passage would be opened to Philadelphia, from the Juniatta, the Tyoga, and the east and west branches of the Susquehannah, which water at least 15,000,000 acres. From this junction the general course of the river is south-east, until it falls into the head of the Chesapeak bay, below Havre-de-Grace. It is above a mile wide at its mouth, and is navigable for sea-vessels about 20 miles only, on account of the rapids. The banks of this river are very romantic, especially where it passes through the mountains, which have every appearance of being burst open by some convulsion of nature.

Besides the before mentioned canals between the western waters and the Atlantic, there are two other canals to which the Pennsylvanians are turning their attention; one is from Preque-Isle, on lake Erie, to Le-Beuf, down the Allegany river to Kiskiminitas, and up this river by a small portage to the Juniatta, which falls into the Susquehannah. The other is from Lake Ontario, to the eastern branch of the Delaware, and down that river to Philadelphia. Both these are practicable, and at no great expense, and no doubt but the spirited mer-

chants of that city will speedily accomplish this great and useful undertaking.

Another very practicable communication is in contemplation; this is between the southern branch of the Tyoga, and a branch of the Allegany, the spring heads of which are very near each other. The Seneca Indians have informed the frontier inhabitants of Pennsylvania, that they can walk four times a day from the boatable waters of the Ohio, to those of the Tyoga, at the place just mentioned; and between the Susquehannah, near where it crosses into Pennsylvania the first time, and the Delaware, is a portage of only 12 miles.

The state of Virginia are not idle spectators of the improvements carrying on by their neighbours, and first it is proper to begin with the noble river Potomak. This river is seven miles and a half wide at its mouth, four and a half at Nomony Bay, three at Aquio, one and a half at Hallooing-Point, one and a quarter at Alexandria, opposite to which the new city of Washington is building, in the state of Maryland, and every state is assessed its respective quota for that purpose; the central situation of which, and the capital river it is upon, must command a vast important trade. The soundings are seven fathoms at its mouth, five at St. George's Island, three at Swans-Point, and up to Alexandria, from whence there are ten feet water to the falls, which are 13 miles above Alexandria.

The distance from the capes of Virginia to the termination of the tide-way in this river Potomak, is above 300 miles, and the river is navigable for large ships nearly to that place, and there it is obstructed by four large falls, and runs through a

vast tract of well-inhabited country to its source. These falls are, first, the little falls three miles above tide-water, which fall 36 feet; next are what are called the great falls, being 76 feet in  $1\frac{1}{4}$  mile; the third are the Seneca falls, of about ten feet in six miles, higher up; and fourthly, the Shenandoak falls 60 miles from the last, where the falls are 30 feet in three miles: from this last place to Port Cumberland is 120 miles, the other obstructions between the falls are of no consequence.

The Legislatures of Virginia and Maryland, in the year 1785, passed acts for opening the navigation of this river; it was estimated that the expense of the canals and other works would amount to 50,000 *l.* sterling, and would be finished in 10 years: it is supposed by a late survey that 45,000 *l.* will complete the undertaking; great progress is already made, and the calls of payment necessary to carry on the work are made very regularly; on each share of 100 *l.* the payment of 40 *l.* has only yet been wanted or demanded. Locks will only be wanted at two places, the great and little falls, six at the former and three at the latter; at the great falls the work is nearly finished; at the Seneca falls the greater part of the business is entirely completed, by removing the main obstacles, and graduating the descent: at the Shenandoak river, where it breaks through the Blue-ridge Mountains, a wonderful deal of labour has already been performed, yet much more is still to be done before it is complete, and that was expected to be done by the year 1790, from Fort Cumberland to the great falls, which are within nine miles of a shipping port.

By an estimate made very lately, it was calculated the tolls would amount at the beginning to 11,875 *l*s Virginia currency, yearly, and it must increase every year, as the quantity of articles for exportation will be augmented in a rapid proportion with the increase of population and the extension of settlements. The number of horses now employed in the carriage of produce to market, will be used for the purpose of husbandry only; and in order to form a just conception of the vast utility of this inland navigation, it will be proper to observe by the map the long rivers which fall into the Potomak of the western waters.

The Shenandoak discharges itself just above the Blue Mountains, and may, according to the Surveyor's report, be made navigable, at a trifling expense, above 150 miles from its confluence with the Potomak. The south branch, still higher, is now navigable 100 miles, through the most fertile lands: between these, on the Virginia side, are many small rivers, that may easily be improved for a boat-passage. On the Maryland side are the Monocasy, Antietam, and the Conegocheague, some of which pass through the state of Maryland, and their sources are in Pennsylvania.

From Fort Cumberland one or two good waggon roads may be made, and the distance will not exceed 35 miles to the Yehogany, a large navigable branch of the Monongahela river, and this last forms a junction with the Alleghany river at Fort Pitt, from which last place it takes its name of the Ohio, or Fair River, and loses its name when it empties itself into the Mississippi.

When arrived at these western waters, the navigation through that immense country is opened in a thousand directions, and to lakes, in many places by portages of less than 10 miles, and at one place by one mile only.

It was scornfully said by foreign nations at the beginning of this undertaking, that the Americans were fond of engaging in great projects, which they could never accomplish, yet this first project of improving their inland navigation leaves no room to doubt of success.

The great Kanhaway is a very large river; the great falls, 90 miles above its mouth, are the main obstacles to its navigation; below this are only five or six rapids, and these passable at low water; from the falls to Green Briar river is 100 miles, and thence to the lead mines is 120 miles, and is 280 yards wide at its mouth.

The little Kanhaway is 150 yards wide at its mouth, and is navigable 10 miles only; it is intended to open a passage from its northern branch, called Junius Creek, with the western waters of the Monongahela into the Ohio.

In the state of North Carolina, is a place called Dismal Swamp, which takes in a large space of land between Pamlico and Albemarle Sounds; its name is sufficient to describe its horrible uncomfortable state, and there is also another large swamp north of Edington, and is partly in this state and in Virginia.

The above are owned by two companies, the Virginia company, of which the illustrious General Washington was a member, holds 100,000 acres, and

North Carolina 40,000 acres; a canal is cutting through this swamp from the head, called the Pasquetank river, to the head of Elizabeth river, about 14 miles long, which will drain this useful land, and convert it to use.

The Charleston State Gazette of the 13th of April, 1802, gives the following account to the public, which proves their unceasing spirit and perseverance in extending their inland navigation.

The proprietors of the charter for opening the navigation of the Wateree and Catawba rivers, have at length seen with much satisfaction the completion of the Santee canal; they intend immediately to recommence their operations, they propose to open the said rivers within the present year by the canal now cutting, deepening, and widening, where necessary, as soon as the state of those rivers will permit.

They are going to double the number of shares to induce the subscribers to be chearful and early in their application, and at only 50 dollars per share; then follow their toll and tax on goods for the term of their charter, which is 99 years; and as a further encouragement to subscribers, they inform them, that a considerable sum is expected to be raised by the sale of the vacant lands, which extend two miles on each side of the Catawba river; the whole length of the intended improved navigation from the North Carolina line down to Campden Ferry, is a distance of 120 miles, in which are reserved to the company 60,000 acres; and as the work cannot be carried on above four months in the year, they do not mean to call on the subscribers for more than 16 dollars a year.



Besides the great advantages of this long inland navigation, they are going to establish a national magazine for the southern states of North and South Carolina and Georgia, for they inform their subscribers, that nature has pointed out the Catawba river, and the two branches, where abundance of metal and ores of different descriptions are found in the greatest plenty. Several furnaces and forges are already built, and six pound guns have been cast and bored there equal to any imported or made to the northward.

The company intend to confine their operations of this season (1802) to remove the obstructions from Rocky Mount to Campden Ferry, and opening a road for a carrying place from above the falls at Rocky Mount, down to the old ferry landing, and in erecting a bridge across Rocky Creek.

An article in the Charleston Gazette, dated April 3, 1802, after mentioning the enormous expense, as they call it, (70,000 dollars, or 16,333 *l.* English money) of the Santee canal, tells the company of proprietors, that yesterday arrived in town (Charleston) by the way of the above canal, Mr. Ebenezer Paine, from Rutherford county, Broad River, North Carolina; Mr. P. performed his voyage in 12 days, being a distance of 300 miles, and reports the canal to be in exceeding good order all the way, and had no difficulty in passing through it, notwithstanding the extraordinary dry season.

These are the principal particulars which I can give at present of this extensive country respecting its improvement by canals and inland navigation. A number of other cuts have been planned from one river into another, and as soon as sufficient

funds are raised to carry them into execution, we may expect to see the internal part of that vast country intersected, to bring the internal produce to market, or for exportation, which will astonish Europe, and will make that country in a few years not inferior to the best cultivated and improved states in the old world. The immortal Washington was the original father and promoter of these canals and improvements, and well did he deserve that admirable motto,—“ Twice the saviour of his country. After conducting her to liberty, he opened her the way to prosperity by new roads and canals, and varying the produce of agriculture.”

Those who wish for further information on this subject of improvements in North America, I beg leave to refer to the journals of Mr. Elkanah Watson, a gentleman who has travelled much both in America and Europe, to be had of any bookseller in London.

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## SOUTH AMERICA.

WE have so little knowledge of this country that nothing of improvements by canals or inland navigation can be related with certainty. Its immense wealth and productions the Spaniards endeavour to keep secret from the rest of Europe, and it is scarcely to be supposed, when they are so indolent as to neglect improving their own country in Europe, that they will do any thing here. The natural indolence of the masters, as also of the natives, who have nothing but perpetual slavery before their eyes, makes

it very improbable that any improvements of this kind are attempted here.

When treating of the canals in Old Spain, I mentioned the project of cutting a canal through the Isthmus of Darien, from Panama to Nombre-de-Dios; to which I may add, that in the Collection of Voyages, vol. iv. it is there mentioned of a great canal cut to draw down the lake of Mexico, which employed 471,154 men, but how long or when performed is not noticed.

Having now given an historical account of the canals that have been completed and projected in this country, as also in others, as far as I am enabled from my own knowledge or extracts from the best historians and travellers, I shall conclude this work, hoping it will answer every purpose of the quarto volume, and, as I observed, at one-third of the expense.

#### EXPLANATION OF THE LOCK TO SAVE WATER,

*(As represented in the annexed plate.)*

THE lock of itself is made as usual. The three cisterns, A. B. C. may be made larger where there is room; but not less than to hold each one third the quantity of water necessary to fill the lock; when, instead of the water of the upper level running to waste over the lock-gates, as at present, it will go through the open sluice or large circular drain, No. 1, which is only one foot or less under ground, into cistern A, which when full will go into cistern B, and that into cistern C. When a barge comes to the upper level, instead of opening the upper gate sluices to lose a lock of water, to let in the barge, draw up

Plan of a Lock to save the Water



the sluice No. 4, out of cistern C, and when that is emptied do the same to No. 3 and cistern B, and also to No. 2 and cistern A, which will fill the lock within one foot in height; then open the gate and let your barge in; and *vice versa* when the barge comes from the lower level, it must consequently come into the lock first, and the lower gate being shut the same operation will raise it to the upper level; the sluices 2, 3, and 4 being directly shut or let down again, the cisterns fill again from No. 1, as before, ready for another barge or barges.

## REMARKS.

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IN treating of the canals of Holland, I have observed that the sagacious Hollander does not make his canals all of one size or dimension, but proportions them to their respective traffic. Thus I have there instanced one mile of canal whose square surface does not exceed two acres of land, and which yearly netts 625*l*. On these canals barges are used, even so small as 5 or 6 tons each.

According to the general application to the British parliament for canals, the people of this country seem to covet them all of the same size, as if all were intended for business on an equal scale. On the contrary, we should imitate the thrifty Dutchman in having some smaller canals, and smaller barges of 5 to 12 tons each, which would answer all purposes for short or cross navigation, and would not only take up less land, but would be made at much less expense; and I should suppose that a barge of 4 or 5 feet wide, 20 to 25 feet long, and  $2\frac{1}{2}$  to 3 feet deep, carrying 6 to 8 tons, would be sufficient for such purposes.

The inclined plane, instead of locks, was first noticed by me in the description of the Chinese method, in my quarto volume; and I am very happy to find that several very eminent engineers have made a considerable improvement on it, and among them the ingenious Mr. Fulton.

I shall not enter into an argument with Mess. Fulton, Tatham, and Chapman on the inclined plane, which they have separately treated on at large, it being foreign to my present abridgement; but it may not be improper just to notice, in as short a manner as possible, Mr. Fulton's statement of different costs in the old lock system, (as he calls it) and the plane in rising 100 feet,

The usual expense of locks, he says, for 25 ton boats is 70*l*. per foot, and for 40 ton boats 100*l*. per foot, which in the first case will cost 7000*l*. and in the second 10,000*l*. Now his plane on an angle of 20 deg. will cost only 2294*l*. 14*s*. consequently a saving in the first instance of 4705*l*. 6*s*. and in the second instance 7705*l*. 6*s*. The particulars of the expense of erecting the inclined plane are needless here, as Mr. Fulton has particularly inserted it in his book, but he also observes, in the case of a trade

totally descending, the loaded boats raising those that are empty, the tub-pit, the drum, wheel, and all that part of the machine for creating power may be saved, amounting to 599*l.* the contingent expenses being likewise reduced in proportion, in which case a double inclined plane to the height of 100 feet would cost only 1635*l.* 10*s.* and by this machine, in the descending trade, 900 tons will be done in 12 hours.

On the Grand Trunk Canal it takes generally five minutes to pass an 8 feet lock, which, to rise 100 feet at that rate, will be 63 minutes. Mr. Fulton says he can pass the 100 feet in height by his double plane in four minutes.\*

A canal 26 feet wide at top and 10 feet at bottom, and 6 feet deep, will require  $12\frac{1}{2}$  acres of land per mile, and will be 12 cubic yards for every yard run, which, if good earth, is a man's day's work, if not wheeled above 10 yards on each side, but if cut deeper or wheeled further,  $1\frac{1}{2}$  per yard for 20 yards more. A canal 6 feet deep should contain 5 feet depth of water.

A canal 60 feet wide at top and 5 feet deep, formed on an angle of 78 deg. will be 47 feet wide at bottom, and the digging will be 30 cubic yards of earth for one yard running measure.

Feb. 1794. The canal from Cardiff to Merthir-Tidvil is completed, and a fleet of canal boats have arrived at Cardiff laden with the produce of the iron-works there, to the great joy of the whole town. The rude tracks, through which the canal passes in some places are constantly improving, from the happy and healthful toil of the husbandman, and in a few years will be forgotten in a garden of verdure and fertility. This canal is 25 miles long; it passes along the sides of stupendous mountains. Nothing appears more extraordinary than, from a boat navigating this canal, to look down on the river Taff, dashing among the rocks 100 yards below. The fall from Merthir-Tidvil to Cardiff is nearly 600 feet. The first barge that arrived at Cardiff was finely decorated with colours, and was navigated from the Mollingriffield works by Mr. Bird, pen. water-bailiff of Cardiff.

Nov. 1794. The Glamorganshire canal has a sea lock at the lower end next the sea, to admit vessels from 10 tons to 300 tons burthen into a large basin with 16 feet depth of water. The largest cargoes of these vessels are landed and housed, as corn, flour,

\* This appears strange, as we shall see, in 1802, a subscription for making a lock on the Somerset coal canal, as they say, "In lieu of the present expensive and tedious mode of unloading, and the inclined plane."



and general merchandise, in two or three days, and in the like time are loaded and sent to sea. As a proof of the time saved, and dispatch in loading and unloading, from the 29th of June to the 15th of April following 245 vessels have been in and out of the lock, and it is competent to accommodate ten times the number, if the trade should ever increase to that extent, which is very likely to happen. The lock and pool duty is 1*d.* per ton, in and out each way; or 2*d.* per ton, on the vessel's register tonnage, for which they lie all the time afloat and out of every danger.

In April 1796, an Oxford newspaper announced a new invention, "Which can so far increase the profits and decrease the expenses attending the present canals, as will amount to some thousand pounds a year." Also, "A new kind of lock, so simple in its construction that one man may pass a boat through either way in 5 minutes time, without any loss of water." Also, "Instead of the present drawbridges others attended with less expense, and which will require very trifling repairs."

1796. In the month of February four flats laden with coals from Lancashire, arrived at the Tower Wharf of the Ellesmere canal, near Chester, being the first vessels which have navigated that part of the canal with coals.

1796. In constructing the canal which has for its object to unite the rivers Severn and Dee, one of the boldest efforts of human invention in modern times is the attempt to convey the water from one mountainous point to another, over one of the deepest dells in Britain, being in perpendicular descent upwards of 90 feet, and in length near 400 feet! The stupendous aqueduct forming this part of the canal is to be one entire trough, made of cast iron!

1796. In the month of February the ship Chelmer, captain Stone, from Portugal, entered the basin of the Chelmer canal navigation, being the first vessel that ever entered the lock of this navigation. The first vessel of coals from Sunderland arrived in the basin a few days after.

1796. On the 2nd day of March, five boats laden with coals, pig iron, &c. entered that branch of the Monmouthshire canal, which extends from Ponty Pool to Newport, being the first vessels which ever navigated that canal. The river at Newport will admit ships of any burthen. The Ebber Vale branch of the canal will be completed in the course of a few months.

1796. A meeting was held at Southampton to consider of the propriety of forming a junction between the Statyn Navigation

the Basingstoke canal; the line of junction to commence at Avel Hill, and to extend 22 miles in length. This measure will be beneficial to government as well as to individuals, saving a great expense in land carriage, of naval and victualling stores, and therefore so, as vessels to and from London, &c. are often detained at Southampton months together by contrary winds. This canal will form an inland communication between the ports of London and Southampton.

The above projected canal from London to Southampton, being not more than 20 miles, might be finished in 12 months, which time of war would save the public several millions, by accelerating expeditions and saving convoys employed between the two ports. Sometimes an expedition is deferred for want of gunpowder, another time for want of guns, a third time for army necessaries, &c. It also requires a variety of winds to proceed from the Thames to Portsmouth, whereas the whole of any convoy through this canal will arrive there in three days time.

May 1, 1796. The grand tunnel on the Leeds and Liverpool canal between Coln and Burnley was opened. The heaviest sailing vessel was 40 minutes passing through. The length of the tunnel 1633 yards, the height 18 feet, and 17 feet wide. This work as planned by Mr. Whitworth, and executed by Mr. Fletcher with great resolution and ingenuity, among very many difficulties; is the most complete work of the kind in the British dominions.

1796. The communication between the Worcester and Birmingham canal and the Stratford-upon-Avon canal to Hockley Heath is just opened.

1796. The Basingstoke canal is completed and navigable to London.

1796. The works on the Walsophorne Tunnel on the line of the Gloucestershire and Hereford canals are carrying on with great activity; the excavations and arch-work extend a mile in length.

1796. The works on the Somersetshire coal canal are proceeding very rapidly.

1796. The French committee of navigation on canals have reported several canals to be properly opened in the interior of France, to facilitate inland navigation. Several new ones are undertaken; one from the Oise to the Sambre, and others are proposed for the employment of the soldiers as soon as peace arrives and they are disbanded.

1798. The Herefordshire and Gloucestershire canal from Gloucester to Ledbury is completed; the opening of this navigation

took place on the 30th of March, when several of the proprietors and gentlemen of the committee, embarked at the junction of the coal branch near Newent, in the first vessel freighted with merchandise consigned to Ledbury, which was followed by three others laden with coal. They passed through the Tunnel at Oxenhall, which is 2192 yards in length, in the space of 52 minutes, and were met at the extremity by several gentlemen, and entertained with a cold collation at the Boyce, the seat of Mr. Moggeridge, one of the proprietors of the valuable coal mines recently opened at Oxenhall. Both ends of the tunnel, as well as the banks of the canal, were lined with spectators, who hailed the boats with reiterated acclamations. It is supposed that upwards of 2000 persons were present on their arrival at Ledbury, (about 9 miles) which they reached in 4 hours. A dinner was provided on the occasion, at the George inn, where the greatest conviviality prevailed, and many appropriate toasts were drank. The advantages which must result from this inland navigation to Ledbury and the adjoining country are incalculable. In the article of coal the inhabitants of this district will reap an important benefit by the immediate reduction in price of at least 10*s.* per ton. Coals of the first quality are now delivered at the wharf, close to Ledbury, at 13*s.* 6*d.* whereas the former price was 24*s.* per ton.

1797. The Grand Trunk canal company have agreed to widen their canal so as to admit the navigation of river boats, in that part of the line which extends from Fradley Heath to the tunnel at Harecastle.

1797. The expenses of the projected Durham canal are estimated in Mr. Whitworth's report at 79,000*l.* and the probable advantages to subscribers are calculated to amount to upwards of 20 per cent.

1797. The canal from Manchester to Stockport was lately opened; as was also, some short time before, the canal from Manchester to Ashton, and another from Manchester to Bolton. So general is the spirit for cutting canals in this quarter, that all the principal towns will probably be visited by water in a few years.

1797. The great undertaking of the Shrewsbury canal is at length completed; a number of boats have lately been sent up with the first flush of water, for the purpose of proving the level, all of which arrived, without any accident, at the extremity of the basin.

1797. The Chester and Ellesmere canals are now connected at Chester, and boats, for the accommodation of passengers, ply

regularly between Chester and Liverpool, and Chester and Beeston Brook. Goods of all sorts, for the purpose of commerce, are also forwarded by the same conveyance. The Chester canal is also navigable to Nantwich, and a water communication is now opened between Cheshire, Lancashire, and all parts of Staffordshire, Shropshire, &c. &c. &c.

1797. The great tunnel of the Birmingham and Worcester canal has been lately completed in a masterly stile. The first brick of this stupendous work was laid the 26th of July, 1794, and the whole of it was arched over the 25th of February, 1797; upwards of 1,780 yards of it were finished in one year: the extent of the tunnel is upwards of a mile and a half, and is distinctly seen from one end to the other; the brick-work throughout the whole is finished with the greatest accuracy. The tunnel was lately passed through for the first time by several vessels of 60 and 80 tons burthen, laden with coals, which landed their cargoes at Hopwood's wharf. Alvechurch, Redditch, Beoley, Studley, &c. will now be plentifully supplied with coals by this canal, and the farmers will be enabled to convey, readily and cheaply, their grain, &c. to Birmingham and other populous towns.

1797. A water communication by canals is now established between Stafford, Wolverhampton, Stourbridge, Dudley Port, Birmingham, and Fazeley; and also between Atherstone, Nuneaton, and Coventry, and the village of Bugbroke, (on the Grand Junction canal) in this county, (Northamptonshire). Boats have lately begun to pass and repass every week to and from Bugbroke and the above places.

1798. At a meeting of the committee of the Salisbury and Southampton canal, it appeared that the works on every part of the canal are completing in the most substantial manner, that the navigation will be open to Dean, by Christmas, and the whole undertaking will be entirely completed by Midsummer next.

1798. The navigation of the Kennet and Avon canal was opened in October, with a barge freighted with a wrought Portland stone staircase, for J. Pearce, esq. of Chilton Lodge, a large quantity of deals, and nine chaldron of sea coal, in the whole amounting to 40 tons. The works being now completely finished from Newbury to Hungerford, a regular conveyance is established, which will forward the goods passing on the river Thames and Kennet from London, and greatly reduce the price of carriage between the metropolis and Bristol.

1798. The canal, which was begun in 1794, from the sea at Swansea, to the Breconshire hills, at Hen-Noyadd, is now finished; it extends 16 miles on an elevation of 372 feet, and has cost, exclusive of its rail-roads, nearly 60,000 l. It is terminated at each end by lime-stone rocks, and by several strata of iron-stone in the vicinity, of the best quality, and inexhaustible as to quantity; the intermediate space of country abounds in every kind of coal and culm, from the hard stone coal used for malting purposes, and the coal used for iron cook, to the most bituminous and caking. The river Tawey, (on whose banks the canal is made) with its brooks, form natural levels to all the veins of coal, culm, iron-stone, and lime; the mines of the country running nearly east and west, and the river and canal nearly north and south, thereby intersecting them; several companies of great respectability, among whom are some from Whitehaven and the vicinity of Coalbrook Dale, are become concerned therein.

Very considerable works are also carrying on at this place for deepening the outer harbour, and extending the new pier, which is in great forwardness, and which was planned by Captain Huddard, of the Trinity House, with a view of large craft being introduced for the West India and foreign trade.

1798. At the general assembly of the proprietors of the Grand Junction canal, held at the Crown and Anchor Tavern, London, on the 5th of June, the committee reported, that the canal was now navigated from the Thames, at Brentford, to Two Waters, at Hemel-Hempsted, being 29 miles; that in three weeks it would be completed to Berkhamsted, and by Michaelmas to Tring and Wendover, amounting in the whole to 47 miles of canal navigation. But the committee called the attention of the assembly to an act of parliament lately passed, enabling the proprietors to supply the metropolis with good and wholesome water; the bringing the pure waters of the Colne to the vicinity of London having always been considered a desirable acquisition for the convenience of its inhabitants, and an additional security from the dreadful ravages of fire; it has not only been long called for by the public, but even engaged the attention of parliament in the year 1650, though from various causes it has never been effected. In attempting to carry this beneficial plan into execution, the line is found capable of being cut on an entire level, and the basin at the termination higher than any other head of water in the environs of London, and as the advantage resulting to the public, as well as to the proprietors,

was so manifest, it was determined to prosecute the works with expedition.

1799. The new canal from Sowerby-bridge to Rochdale was lately opened for business. The Travis yacht first crossed the head level, decorated with the Union flag, emblematical of the junction of the ports of Hull and Liverpool, with colours flying, music playing, attended by the Saville yacht, and thousands of spectators: a display of flags on the warehouses, and sound of cannon, announced to the rejoicing neighbourhood the joyful tidings, which in the evening were realized by the arrival of several vessels, laden with corn, timber, &c. &c. &c.

1799. The Barnsley canal was opened on the 8th of June, on which occasion the proprietors of the Air and Calder navigation ordered two of their sloops, completely rigged and manned, to attend; these sloops left the river Calder about nine in the morning, with cargoes of yarn and other merchandise, and proceeded to Barnsley, amidst a vast concourse of spectators. The beneficial effects of this canal in a rich mineral country, hitherto landlocked, cannot fail to be immediately felt by miners, farmers, manufacturers, and the country at large.

1799. The navigation of the Kennet and Avon canal, from Hungerford to Great Bedwin, was lately opened: a barge of 50 tons, laden with coals and deals, &c. arrived for the first time at the latter place. This canal will open a line of navigation 16 miles in length, over a country before very remote from any navigable river.

1799. The total calls on the Ashby-de-la-Zouch canal are at this time 90 per cent. which indicate its speedy completion. Earl Moira's coals are already announced at Bosworth for 8*s.* 6*d.* per ton.

1799. Several gentlemen of the Wilts and Berks canal committee have lately sailed from its termination near Daunton Park to Cuningin Park, near Colne, where the tunnel under the road is now constructing; then they proceeded to Chippenham and to Semington, where this canal joins the Kennet and Avon. The Marquis of Lansdown was one of the party.

1799. Goods are now regularly conveyed upon canals from London to Bristol, South Wales, Worcester, Birmingham, Manchester, Liverpool, and Lancaster. The price of light goods from London to Bristol, is no more than 3*s.* per ton, of heavy goods 3*s.* of light goods to Liverpool 5*s.* of heavy goods 6*s.* for low

priced goods, heavy, and not damagable, is to Bristol only 26*s*. to Birmingham 38*s*. and to Manchester 55*s*. per ton.

1800. The canal from London to Basingstoke, which has been completed some years, conveys goods thither for 15*s*. per ton, for all parts of Hants and Wilts, and many parts of Dorset and Somerset, to the great convenience of the manufacturers, traders, and inhabitants of those parts. The canal from Southampton to Salisbury is in great forwardness, and it is to be hoped that it will be continued to Bristol, to communicate with the English and Bristol Channels.

1800. The Oxford canal shares of 100*l*. stock are now worth 194*l*. each, as far as a sale by auction can be received as a criterion.

1800. The Peak Forest canal, which affords a cheap and easy water communication between the Peak, the adjacent country, and the most populous parts of Lancashire, was opened on the 1st of May. The completion of this bold and difficult undertaking, through numerous hills and valleys, precipices and declivities, is an object of general admiration, and the advantages it promises to the public are of the first importance, and at 10*l*. per cent. less than the first estimation.

1800. Four hundred and fifty shares have been forfeited by the subscribers to the Kennet and Avon canal, in consequence of defaults in the payments of the calls.

1800. In the month of July, Mr. Yates, master and proprietor of a canal barge at Coalbrook Dale, lately went all the way, which is upwards of 400 miles by water, from that navigation to Hambro' wharf, near London bridge, in 14 days. He touched at Worcester, Gloucester, and other towns with part of his cargo; this is the first barge that ever made the entire passage.

1800. The Grand Junction canal, which is just opened, forms now a complete canal communication between the Thames, the Severn, the Mersey, and the Humber.

1800. According to Mr. Dodd's report on the intended Grand Surry canal, it is to run from Kennington common to the left of the road by Stockwell, Clapham, Tooting, and Merton, and across Norbiton common to Kingston. A branch from Norbiton common will extend to Epsom, by the right of Malden and Ewell; another branch will run through Mitcham, and across Mitcham common to Croydon; and from Kennington common there will be other cuts, extending to the Thames at South Lambeth, and to

the King's Yard at Deptford, and to Greenland Dock and Rotherhythe. The distance from the basin in Southwark to Epsom will be 16 miles by the canal, to Croydon 12 miles, to Kingston 14 miles. The whole line will be 28 miles, and Mr. Dodd's total estimate 87,000 *l.* and the annual produce to the proprietors will be upwards of 8,000 *l.*

N. B. It is to be hoped Mr. D. is more exact in this calculation than in the tunnel under the Thames, for there was a most egregious mistake.

1800. Oct. 13, a public exhibition of Mr. Fusell's balance lock on the Dorset and Somerset canal, was again made, and laden boats were with great facility transferred to and from the upper to the lower level, in a manner that gave great satisfaction to a numerous company of noblemen, gentlemen, and others, who were assembled on the occasion. The locks were continued in action two hours, that the ingenious might have ample testimony of its principles and utility, which are now fully established and admitted, not only by committees of canal companies, but also by the ablest mechanics, who have given it their inspection. There seems no doubt that the balance lock will be brought into general use in all canal undertakings, where the saving of water is an object of consideration \*.

1801. The branch of canal leading from the basin in Buckingham to the Grand Junction canal, was opened with great rejoicings on the first of May: a number of the principal proprietors, including the Marquis of Buckingham, Mr. Fraed, and Mr. Selby, gentlemen of the committee; Mr. Box, the treasurer, and a large party of ladies and gentlemen, were in a barge, which led the way to 12 other barges, laden with coals, slate, and a variety of merchandise. This branch, which is  $9\frac{1}{4}$  miles in length, has been completed in eight months time, and will secure, to an extensive district of country, the most substantial benefits.

1801. It is in contemplation to form, by canals, a grand junction of the rivers Thames, Medway, and Rother, in Sussex; to establish an inland communication with, or union of, the ports of London, Rochester, Maidstone, &c. with Rye, in Sussex. The great national utility, private advantages, &c. of such a navigation,

\* The reader will see in 1802, that a subscription was set on foot to raise money to make a lock in this very place, as they call it, "instead of the present expensive and tedious mode of unloading, and the inclined plane."



will be obviously apparent, when it is considered that Rye Harbour has been proved, from actual surveys, to be capable of improvement for the admission of vessels of the greatest burthen; of course a circuitous, and at times, difficult, dangerous, and uncertain navigation from Gravesend, the Nore, North and South Foreland, the Downs, Goodwin Sands, and Dungeness, would be avoided, and thereby lives and property, to an incalculable number and amount: it would also be an expeditious, cheap, and safe conveyance of timber, or naval stores, &c. in war time, from out of the wealds of Kent and Sussex, into five royal dock yards, and as many private yards, in the river Thames, and in peace would be a secure, near, and convenient intercourse from London to Rye, and as far as it goes to the western ports of the kingdom, and to foreign parts.

1801. Application is made to parliament for a bill for making and maintaining a navigable canal from Spitty, in the parish of Llanelly, to or near the town of Llandowry, which canal is to pass through the several parishes of Llanelly, Llongennoch, Llanedy, Llandebye, Llandinger, &c. all in the county of Carmarthen.

1801. An application is now made to parliament for making a navigable canal from the town of Cheltenham, to the river Avon, near Tewksbury, to pass through the parishes and townships of Cheltenham, Swindon, Uckington, Elmstone Hardwicke, Elmstone Tredington, and Tewksbury, all in the county of Gloucester.

1801. The Thames and Medway canal is completed from Gravesend to Higham; it has a culvert communicating with the Thames, in which the engineer, (not Mr. Dodd) has introduced a valve by which to empty and fill the canal at pleasure.

1801. The Wilts and Berks canal is now completely navigable from Semington to Chippenham, Calne, Dauntsey Park, and Bowdes Farm, near Wootton Bassett, and an uninterrupted communication by water, by the junction of the above with the Kennet and Avon canal, from those places to Bath and Bristol; the neighbourhood on the line will in consequence be greatly benefitted by obtaining a supply of excellent coal, at a cheap rate, and the timber and other articles ready to be conveyed will create a considerable trade immediately.

1802. The locks, canal, and basin, from which the Surry iron rail-way, now in agitation, is to commence at Wandsworth, have been lately opened, and the water admitted from the Thames. The first barge entered the lock amidst a vast number of spectators,

who rejoiced at the completion of this part of the important and useful work. The ground is laid out for the rail-way, with some few intervals, all the way to Croydon; and the undertakers are ready to lay down the iron; it is expected to be completed by Midsummer.

N. B. The iron rail-ways are of great advantage to the country in general, and are made at an expense of about 300 *l* per mile. The advantages they give for the conveyance of goods by carts and waggons, seem even to surpass, in some instances, those of boat carriage by canals.

1802. A canal is proposed to be cut from Newcastle to Haydon bridge, and books are opened for carrying it into immediate execution, as it will be a work of the most extensive and essential importance to the commerce and manufactures of Newcastle, and the circumjacent country.

1802. The completion of the Glamorganshire canal from Merthyr Tidwell to Cardiff, has opened a ready conveyance to the vast manufactory of iron established in the mountains of that country, and many thousand tons are now annually shipped from thence; a commodious dock has been also formed at the end of the canal, where vessels of large burthen may lie afloat, and a little below this dock ships are admitted into what is termed a sea-lock, which communicates with the ocean just within the entrance of Cardiff river. On the banks of the dock, spacious warehouses are erected by the proprietors of the iron-works. At Merthyr Tidwell these various operations diffuse a spirit of exertion through the country, and will bring into action talents that have hitherto lain dormant. Mr. Watkin George, of Cyfarthva, has erected a wheel, 50 feet in diameter, to blow ~~the~~ furnaces, turned by a very small stream of water: and at Aberdare another extraordinary machine has been constructed, in which two wheels, each 40 feet diameter, working like a figure of 8, increase the power of each other so much, that the water which drives the upper wheel, falls down and arises in turning the lower one: the effect and utility of the above canal is exemplified in divers different ways and schemes. At Margam, in Glamorganshire, a stupendous machine is now erecting to roll copper; two vast wheels of iron, 24 feet in diameter, are set in motion by a steam-engine, one of the wheels, called a fly, makes 30 revolutions in a minute, and regulates the movements of the whole machine: notwithstanding the iron-works

already established on and near this canal, nearly 20 blast furnaces are now erecting.

1802. At the last general half-yearly meeting of the company of proprietors of the Leicester and Northampton union canal at Market-Harbro', it was among other things unanimously resolved, that the canal should be carried forward to Harbro', and also to join the Grand Junction canal in the most convenient place, and a committee was appointed to procure the proper surveys.

1802. The plan of the line of inland navigation between the east and west seas again revives, so as to form a canal between Newcastle and Maryport, which has long been the subject of popular discussion, and rejected by parliament some years ago.

1802. A beautiful chart of the canals in Russia is just published, which contains all that have been formed between the White and Black Sea, and between the Baltic and the Caspian, from which may be seen the great inland navigation of the interior trade of Russia, by the establishment of canals, sluices, and locks, &c. as described in page 33 of this abridged history. The famous Oginski canal, that communicates between the rivers Dnieper and Niemen or Memel, which was begun some years ago by the Poles, and then lay neglected, is now so far extended, that it will be ready in the course of this year to navigate. In this present year a new canal between the rivers Somin and Tickwinka, eastward, from Lake Ladoga, is begun, and will be finished in the year 1804.

1802. The sum of 400,000*l.* has been subscribed as a stock to be employed in making a canal on the north side of London, from the basin of the Paddington canal to the London docks at Wapping.

1802. The canal between Glasgow and Leith is now in such progress towards its final execution, that there remains no doubt but the trade of North Britain will soon have the advantage of it.

1802. The canals from Chalons-sur-Saone to Paris, (being 65 leagues) will be finished and opened this year. The various objects of the fine arts, plundered from Italy, Greece, Egypt, &c. are there waiting for their opening, to be conveyed to the capital of France by water, being 176 pieces, statues, busts, capitals, sculptures, bas-reliefs, various objects, paintings, &c. &c. &c.

1802. The new canal to the town of Horncastle was opened the 16th of September, when three vessels, richly ornamented with colours, entered the basins of the navigation; they were hailed by ropes, amidst the acclamations of more than 2,000 spectators, to the great benefit of that town and the country round.

1802. The Duke of Bridgewater, highly to his credit, devotes much of his attention to commerce, by which he has attained an immense fortune, and by means of a canal of his own, at least 40 miles in length, (with a single lock \*) covered with vessels of various sizes, moving in different directions, facilitating interior communications, &c, &c. carries on an extended lucrative business.

1802. A canal is in agitation to be formed, by which a complete line of inland navigation between the city of London and the port of Lynn †, in Norfolk, under the direction of Mr. R. Dodd; it is to be named The North London Canal, and is expected to be the only means of reducing the price of the principal articles of provision in London markets. Another canal of great national importance is about being conducted from Deptford to Portsmouth ‡ and Southampton, to the naval arsenals there and Gosport, and may be completed for 348,735 *l.* This canal is preferred to an iron rail-road, as the carriage is much cheaper, for instance, 60 tons of corn could not be carried from London to Portsmouth on an iron rail-road for less than 125 *l.* 10*s.* but by a canal for 49 *l.* 5*s.* The communication between the canal at Paddington and the West India docks, is to be effected by an iron rail-road only.

1802. A meeting of the principal inhabitants of Sandwich and Canterbury has been held at the latter place, to consider of an application to parliament for cutting a canal from Canterbury to the sea. Two engineers are making surveys to report on this subject directly.

1802. The subscription for making locks on the Somersetshire coal canal, for conveying coals and other articles from the upper

\* I think it should have been (without a single lock.)

† The plan of this canal was first mentioned by the author of this work, published by Hooper, in Holborn, 1785, repeated in the quarto volume, and laid down in that map, published by Taylor, 1791.

‡ The route of this canal is also laid down in the map in the quarto volume by the same author, who has particularized the utility of this canal.

The first of these is the fact that the  
 government has been unable to  
 maintain a stable currency. This  
 has led to a loss of confidence  
 in the government and a  
 consequent loss of support  
 from the people. The second  
 is the fact that the government  
 has been unable to maintain  
 a stable economy. This has  
 led to a loss of confidence  
 in the government and a  
 consequent loss of support  
 from the people. The third  
 is the fact that the government  
 has been unable to maintain  
 a stable society. This has  
 led to a loss of confidence  
 in the government and a  
 consequent loss of support  
 from the people.